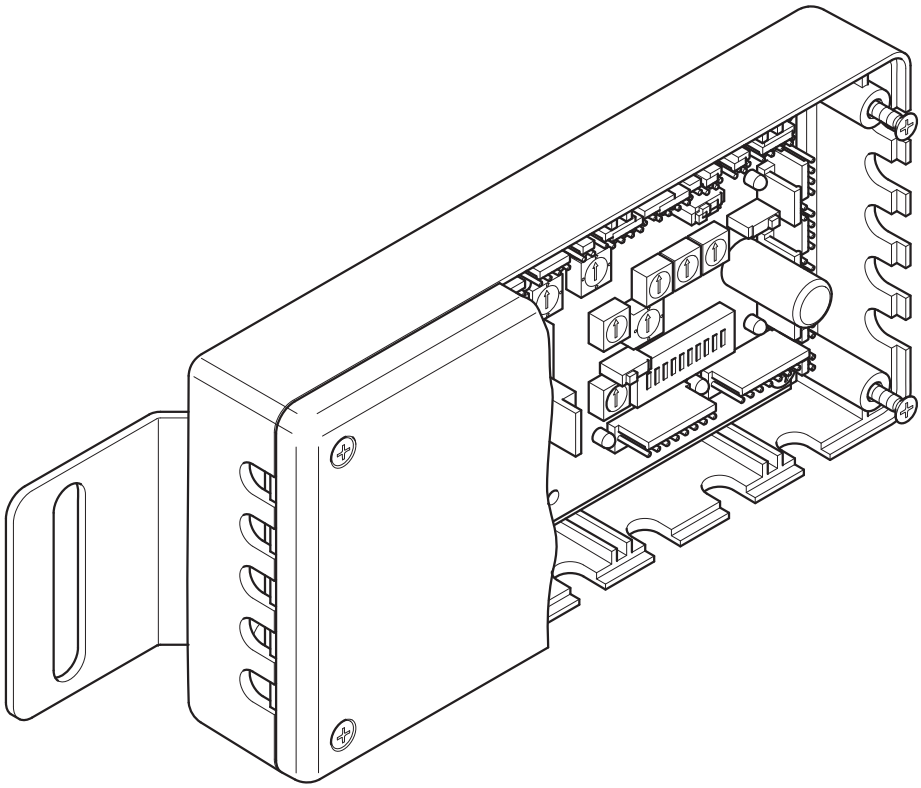
INTERROLL®

INSPIRED BY EFFICIENCY



User manual

Interroll Z-Card 3.0

Version 1.2 (09/2013) en
Translation of the original instructions

Manufacturer
Interroll Automation GmbH
Dietmar-Hopp-Straße 3
D-74889 Sinsheim
Germany
Tel. +49 72 61 938 0
Fax. +49 72 61 938 124
www.interroll.com

Copyright
The copyright of this manual remains with Interroll Corporation. The operating instructions contain technical regulations and drawings which may not be reproduced partially or in full, transmitted by any means, utilized without permission for competitive purposes or disclosed to third parties.

Table of contents

Introduction
- Information about the operating instructions . . . 2
- Warnings in this manual . . . 2
- Further symbols . . . 3

Safety
- General safety instructions . . . 4
- Intended use . . . 4
- Unintended use . . . 4
- Qualified persons . . . 4
- Dangers . . . 5
- Interfaces to other devices . . . 5

Product information
- Components . . . 6
- Connections and switches . . . 7
- Dimensions . . . 8
- Type plate . . . 8
- Control technology . . . 9
- Product description . . . 10
- Inputs and outputs . . . 12
- Rotary and dip switches . . . 20
- LEDs . . . 24
- Technical specifications . . . 25
- Program descriptions . . . 26
- CAN bus communication . . . 46

Transport and storage
- Transport . . . 51
- Storage . . . 51

Assembly
- Warnings concerning proper assembly . . . 52
- Installing the Z-Card in a conveyor system . . . 53
- Warnings concerning electrical installation . . . 54
- Electrical installation . . . 54
- CAN bus connection . . . 55

Initial startup and operation
- Initial startup . . . 56
- Operation . . . 56

Maintenance and cleaning
- Warning notices concerning maintenance and cleaning . . . 57
- Maintenance . . . 57
- Cleaning . . . 57

Troubleshooting
- Troubleshooting . . . 58

Abandonment and disposal
- Abandonment . . . 59
- Disposal . . . 59

Appendix
- List of abbreviations . . . 60
- Accessories . . . 60
- Installation declaration . . . 64

Introduction

Information about the operating instructions

Contents

This manual contains important advice, notes and information about the Z-Card in all phases of its lifecycle:
- Transport, assembly and start-up
- Safe operation, maintenance and troubleshooting, disposal
- Accessories

Validity of the manual

The manual describes the Z-Card as it is delivered by Interroll.

In addition to this manual, special contractual agreements and technical documents apply to special versions.

The manual is part of the product

- ➢ For trouble-free, safe operation and warranty claims, read the manual and follow the instructions before handling the Z-Card.
- ➢ Keep the manual near to the Z-Card.
- ➢ Pass the manual on to any subsequent operator or occupant of the Z-Card.
- ➢ Interroll does not accept any liability for faults or defects due to non-observance of this manual.
- ➢ If you have any questions after reading the operation manual, feel free to contact our customer service. See the last page for your local contact information.

Warnings in this manual

The warnings in this document refer to risks which may arise while using the Z-Card. For relevant warnings, *see "Safety", page 4* and the warnings at the beginning of each chapter.

There are three categories of danger. The following signal words are used in the document as required:
- Danger
- Warning
- Caution

Signal word	Meaning
Danger	Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
Warning	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
Caution	Indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.

Structure of warnings

⚠ DANGER

Nature and source of the hazard
Possible consequence of non-observance

- ➢ Information about how to avoid the hazard.

Further symbols

NOTICE

This symbol identifies possible material damage.
➢ Information about how to avoid damage.

This symbol displays safety instructions.

This symbol marks useful and important information.

➢ This symbol marks the steps that have to be carried out.

Safety

General safety instructions

The Z-Card is designed according to the technical state of the art and is reliable in operation, once distributed. However, risks may still arise.

- Risks of physical injury to the user or bystanders.
- Adverse effects of the Z-Card and other material.

⚠ Disregarding the warnings in this manual may lead to serious injury.

- ➢ Always read the entire operating and safety instructions before starting to work with the Z-Card and follow the information contained herein in full.
- ➢ Only instructed and qualified persons may work with the Z-Card.
- ➢ Always keep this user manual at hand when working on the Z-Card so that you can consult it quickly if required.
- ➢ Always comply with relevant national safety regulations.
- ➢ If you have any questions after reading this user manual, feel free to contact our customer service. See the last page for contact information.

Intended use

The Z-Card must only be used for industrial applications and in an industrial environment for the separate control no more than four 24 VDC motors. In specifically defined cases, two additional motors can be used in parallel to the existing motors. The Z-Card must be integrated into a conveyor module or conveyor system. Any other use is considered inappropriate.

Use of the Z-Card is only allowed in the areas described under product information. It must only be operated within the defined operating limits.

Any modifications that affect the safety of the product are not permitted.

Unintended use

Applications not according to the intended use of the Z-Card require approval from Interroll.

Qualified persons

Qualified persons are persons who read and understand the manual and, taking national regulations into account, can competently execute incidental work.

Only instructed and qualified persons may work with the Z-Card, taking the following into account:

- the relevant manuals and diagrams,
- the warning and safety instructions in this manual,
- the system specific regulations and requirements,
- national or local regulations and requirements for safety and accident prevention.

Dangers

⚠

The following list provides information about the various types of danger or damage that may occur while working with the Z-Card.

Bodily injury

- Maintenance or repair work must only be performed by authorized and qualified persons in accordance with the applicable regulations.
- Before using the Z-Card, ensure that no unauthorized persons are near the conveyor.

Electricity

- Only perform installation and maintenance work after you have switched off the power.
- Ensure that the power cannot be turned on accidentally.

Working environment

- Do not use the Z-Card in areas where there is a hazard of explosion.
- Remove equipment or material which is not required from the workspace.

Faults during operation

- Regularly inspect the Z-Card for visible damage.
- If you notice smoke, switch off the power immediately and ensure that it cannot be switched on again accidentally.
- Contact qualified personnel immediately to find the source of the fault.

Maintenance

- Because the product does not require maintenance, you only need to inspect the Z-Card regularly for visible damage and that all cables and screws are firmly in place.

Accidental motor starts

- Exercise caution when installing or performing maintenance on the Z-Card and when troubleshooting, as a start signal may accidentally be triggered, unintentionally starting one of the connected motors.

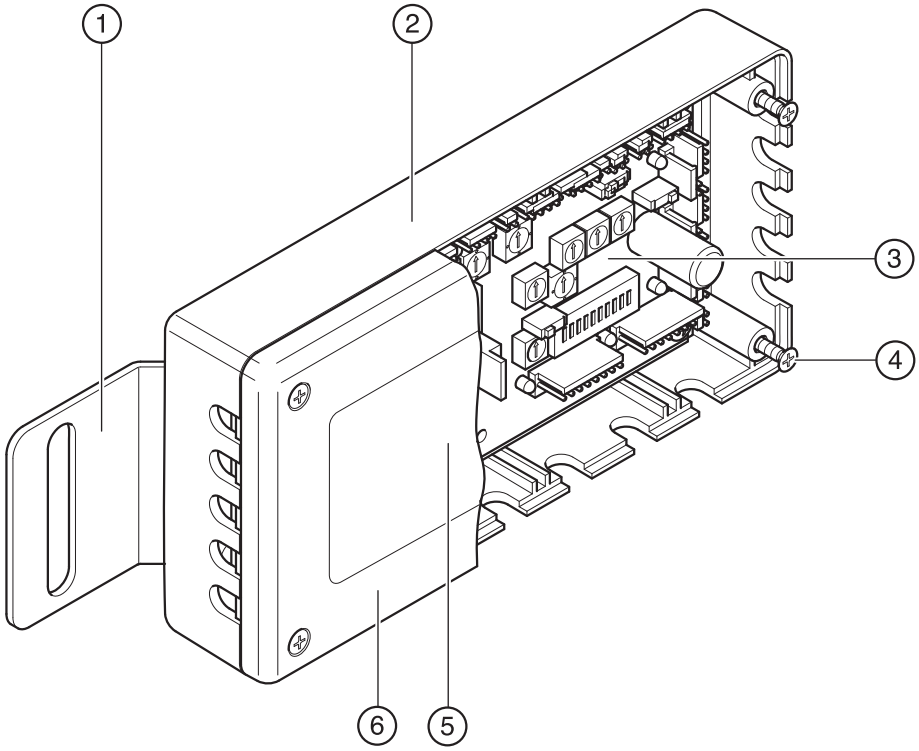
Interfaces to other devices

By assembling the Z-Card in a conveyor module, further hazards may occur. These hazards are not part of this manual and have to be analyzed during the design, installation and startup of the conveyor module.

- After assembling the Z-Card in a conveyor module, check the whole system for a new potential dangerous spot before switching on the conveyor.

Product information

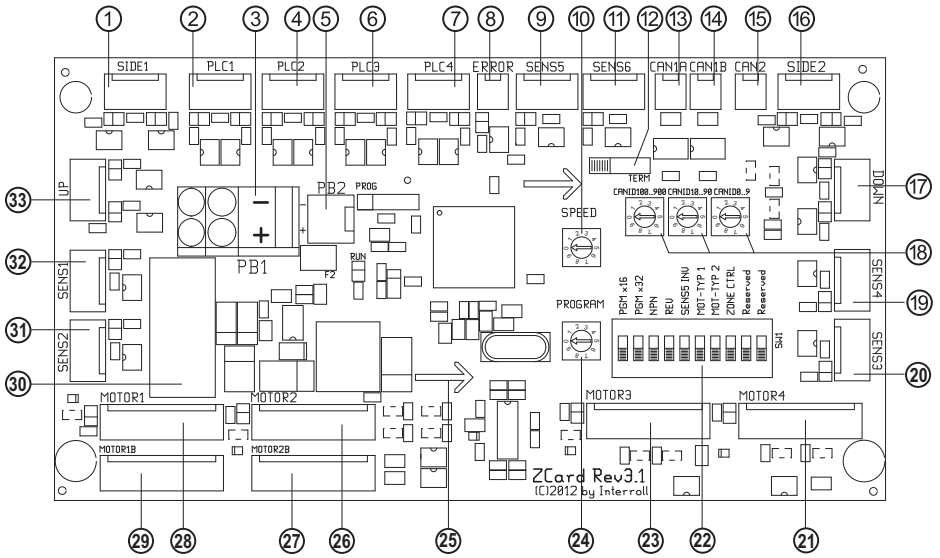
Components



Overview

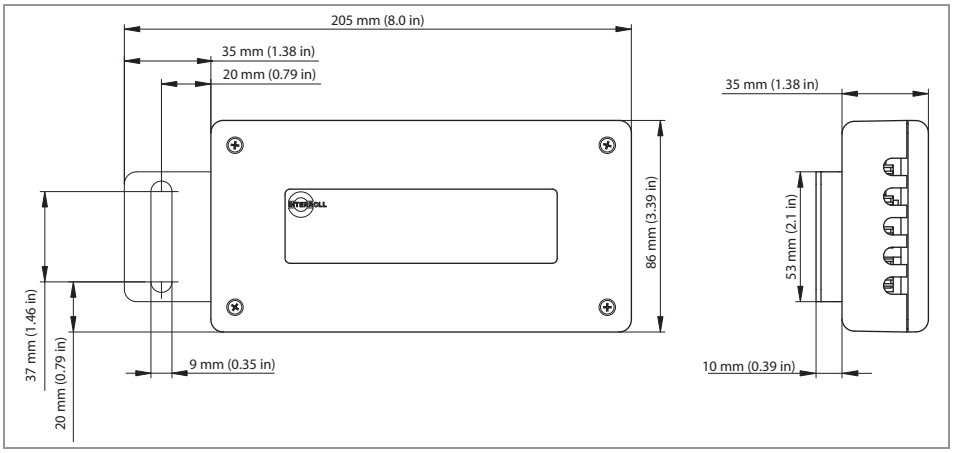
① Box holder
② Box
③ Z-Card board
④ Cross-drive screws
⑤ Label
⑥ Cover

Connections and switches



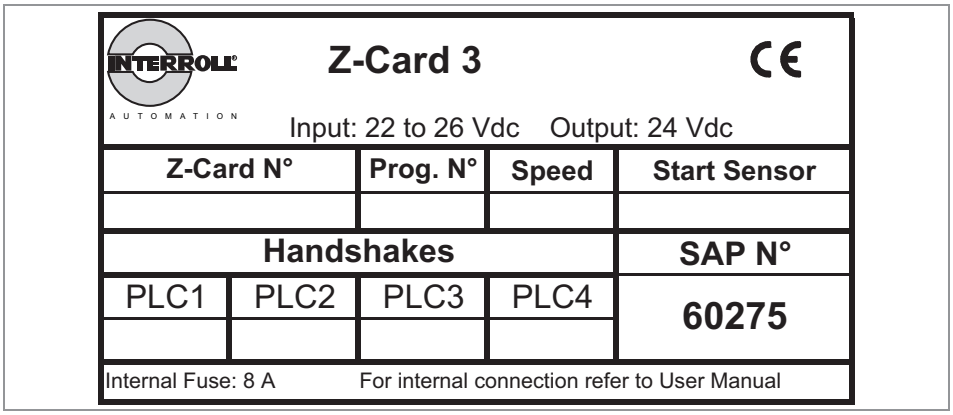
① Connection merge/diverter 1 (SIDE1)
② PLC1 connection
③ Main power supply connection
④ PLC2 connection
⑤ Controller power supply connection
⑥ PLC3 connection
⑦ PLC4 connection
⑧ Error output connection
⑨ Sensor 5 connector
⑩ Speed rotary switch
⑪ Sensor 6 connector
⑫ Switch for CAN bus termination resistance
⑬ CAN bus connection
⑭ CAN bus connection
⑮ Connecting CAN bus branch
⑯ Connection merge/diverter 2 (SIDE2)
⑰ Downstream module connection (DOWN)
⑱ ID rotary switch
⑲ Sensor 4 connector
⑳ Sensor 3 connector
㉑ Motor 4 connection
㉒ Dip switches 1-10 (*see page 22*)
㉓ Motor 3 connection
㉔ Program rotary switch
㉕ Marking of direction of travel
㉖ Motor 2 connection
㉗ Second motor 2 connection
㉘ Motor 1 connection
㉙ Second motor 1 connection
㉚ Fuse
㉛ Sensor 2 connector
㉜ Sensor 1 connector
㉝ Upstream module connection (UP)

Dimensions



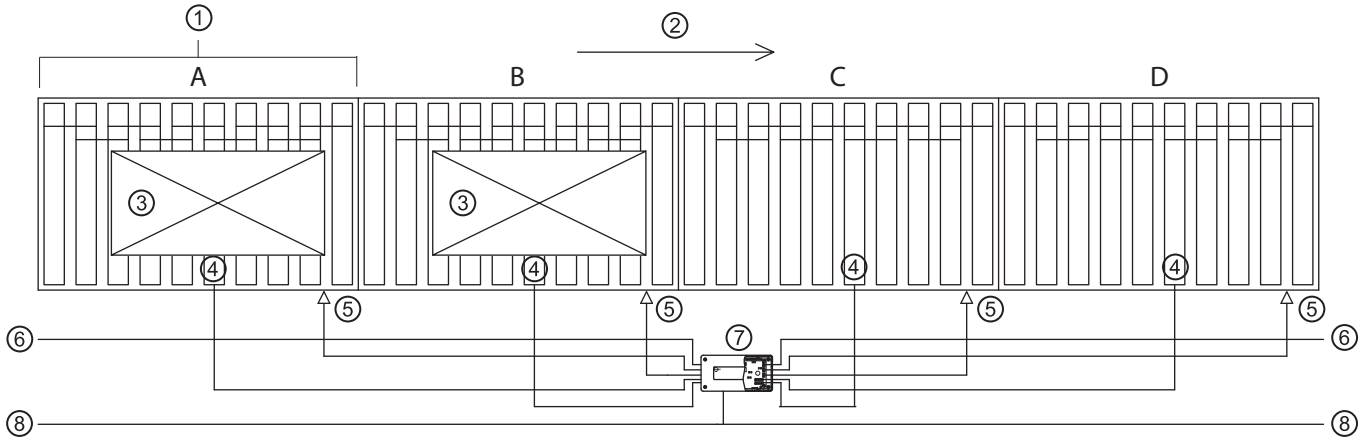
Type plate

The information on the type plate is used to identify the Z-Card.



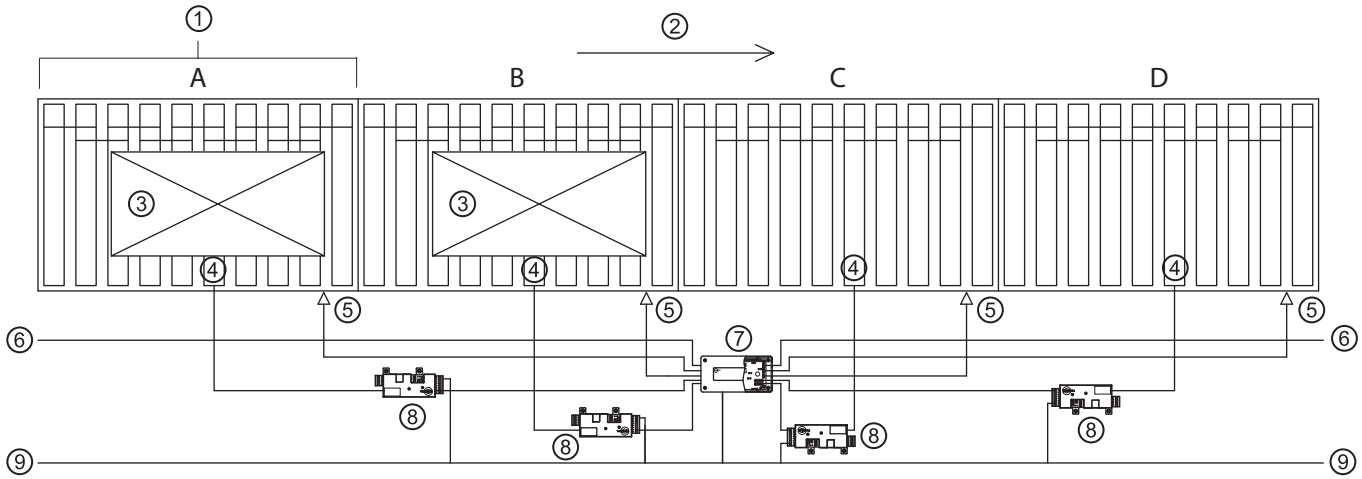
Control technology

Principle of zones



Typical Z-Card conveyor configuration for RollerDrive EC310

① Zone
② Direction of travel
③ Package
④ RollerDrive
⑤ Sensor
⑥ UP/DOWN communications cabling
⑦ Z-Card
⑧ +24 VDC / GND



Typical Z-Card conveyor configuration for RollerDrive EC1xx (additional DriveControl necessary)

① Zone
② Direction of travel
③ Package
④ RollerDrive
⑤ Sensor
⑥ UP/DOWN communications cabling
⑦ Z-Card
⑧ DriveControl
⑨ +24 VDC / GND

ZPA (zero pressure accumulation)

The Z-Card provides true zero pressure accumulation and other control options to a conveyor system. Each Z-Card controls up to four zones. A zone is a short conveyor section which consists of a RollerDrive, a DriveControl if applicable, several idler rollers, and associated sensors and switches.

Zero pressure accumulation occurs as zones hold packages until the next downstream zone is identified by the logic device as "clear". When accumulation occurs, a signal is passed upstream until each consecutive zone is occupied. Packages never push each other, and no line pressure occurs.

In the figure above, the Zone A sensor has detected a package. The Z-Card of Zone A detects that a package is present in the zone, checks whether Zone B is clear and requests permission to transport the package further to Zone B. Since there is also a package in Zone B, the Z-Card of Zone B denies permission until this package has been transferred to Zone C (single mode) or at least until onward transport has been started (wave-like train release mode).

The Z-Card of Zone A activates the RollerDrives in this zone only after it receives permission from the Z-Card of Zone B.

Product description

A Z-Card can control up to four RollerDrives at different speeds and receive feedback signals from up to five sensors. Depending on the software, one Z-Card is responsible for up to four zones. The combination of a Z-Card and the connected zones, RollerDrives, DriveControls, and sensors is referred to as a "module".

To configure larger conveyor systems, several modules can easily be connected via UP/DOWN/SIDE handshakes on the Z-Card. To configure the system, specific modules or to visualize the system and current status, it is also possible to connect a higher-level control system (e.g. a PLC) via a gateway (e.g. Profibus/CAN bus) to the internal CAN bus. This requires that the customer provide only the interface to the PLC gateway. No programming on the CAN bus is required.

The information necessary to transport packages between two different modules/zones can be exchanged via the UP/DOWN/SIDE interface. The Z-Cards are designed for easy wiring via the CAN bus to allow simple and fast startup and control of a conveyor system.

Each Z-Card contains a set of pre-defined zone functionalities that can be set with the program switch.

Applications

- Zero Pressure Accumulation (ZPA) function for all standard modules: straight sections, curves and merge/diverter sections.
- Low pressure accumulation (LPA) function for straight sections and curves
- Start/stop function
- Board-to-board exchange of data (4 interfaces)
- Board-to-board exchange of data via PLC (4 interfaces)
- CAN Bus applications
- Error evaluation

Hardware features

- Motor output 4 x EC
- Variable motor speed (via rotary selector)
- Direction of rotation of motor selectable (FWD/REV)
- Selectable RollerDrive type
- Program switch
- CAN Bus
- Second CAN bus for branches
- CAN terminator switch
- ID switch
- UP/DOWN interface
- SIDE1 / SIDE2 interface
- 6 sensor interfaces
- PNP/NPN sensors selectable
- Sensor 5 – inverting switch (start sensor)
- 4 PLC interfaces (digital I/O)
- Power-LED
- separate digital error output
- LEDs for sensor, motor and PLC states

Software features

- Zero pressure accumulation ZPA (single- and train-release)
- Low pressure accumulation (LPA) function
- Merger and diverter control
- Used as bus interface (without internal logic)
- Used as digital interface (without internal logic)

Inputs and outputs

A general description of the terminals is given below. The cables and the meaning of the connections depend on the selected program.

UP / DOWN / SIDE1 / SIDE2 / PLC1 - PLC4

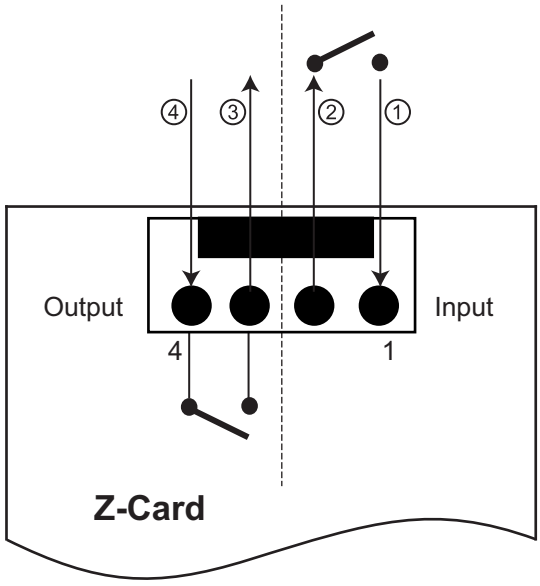
A galvanically isolated input and output is provided for each connector. The function depends on the module type and configuration (*see "Program descriptions", page 26*).

Pin	Function	Wire color in connecting cable
1	$V_{PLC, on}$: Input = start/stop signal from the PLC or (switched) 24 V from pin 2	amber
2	V_{PLC}: +24 V for potential-free contact of the PLC or switch to pin 1	brown
3	Optocoupler output, digital output, status notification (e.g. position occupied or available)	green
4	Optocoupler, external +24 V feeder point	white

NOTICE

Risk of damage to the Z-Card due to short circuit

➢ Do not connect pin 2 to ground.

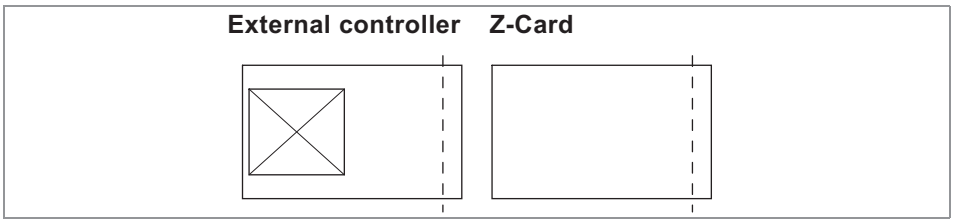


Example of wiring for PLC connection

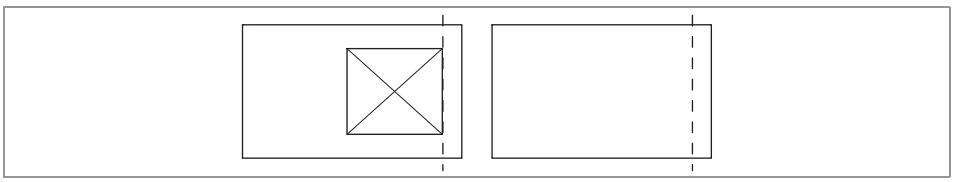
① Signal input from PLC (at same potential as Z-Card) or (switched) 24 V from pin 2
② Permanent 24 V output
③ Signal output (switched from pin 4)
④ $V_{external}$; max. 24 V (e.g. from PLC)

Output current max. 20 mA

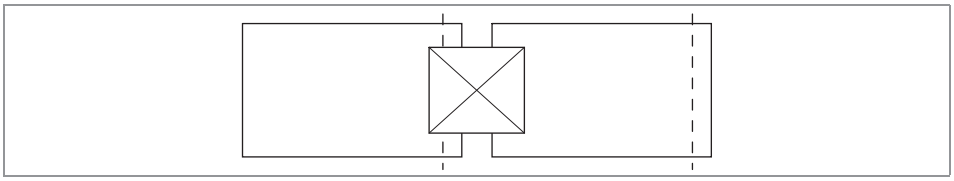
The following example shows which signals are sent or expected **on the UP connection Z-Card** if the **external controller is upstream from the Z-Card**:



Signal from the external controller (pin 1/2)	Signal from Z-Card (pin 3/4)
Low (no packages present)	High (zone is open, packages can be fed in)

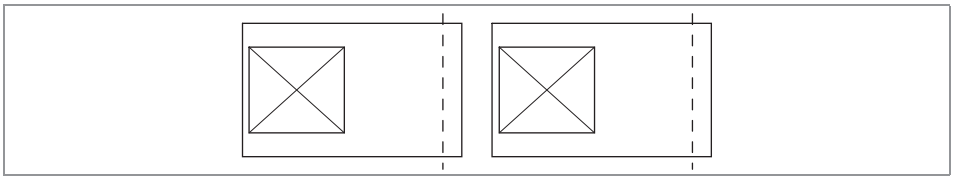


Signal from the external controller (pin 1/2)	Signal from Z-Card (pin 3/4)
High (packages ready for transfer)	High (zone is open, packages can be fed in)

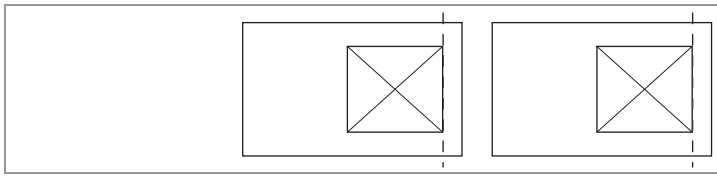


Signal from the external controller (pin 1/2)	Signal from Z-Card (pin 3/4)
High (packages ready for transfer)	High (zone is open, packages can be fed in)

As soon as the external controller switches from High to Low, the Z-Card also switches from High to Low. Both signals must be High as long as both systems on the transport are active.

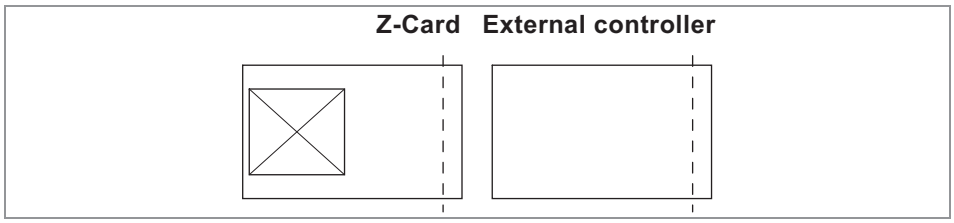


Signal from the external controller (pin 1/2)	Signal from Z-Card (pin 3/4)
Low (no packages present)	Low (zone is occupied, no new packages can be fed in)

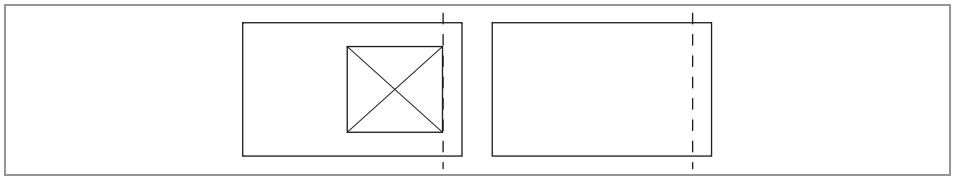


Signal from the external controller (pin 1/2)	Signal from Z-Card (pin 3/4)
High (packages ready for transfer)	Low (zone is occupied, no new packages can be fed in)

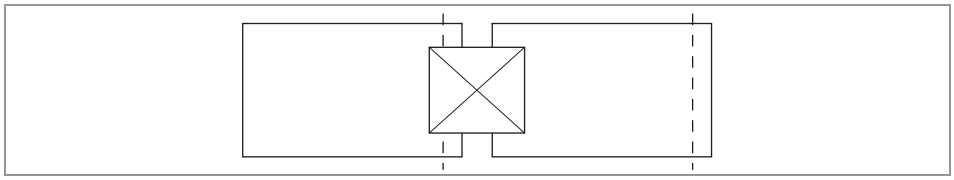
The following example shows which signals are sent or expected **on the DOWN connection Z-Card** if the **external controller downstream of the Z-Card**:



Signal from Z-Card (pin 3/4)	Signal from the external controller (pin 1/2)
Low (no packages present)	High (zone is open, packages can be fed in)

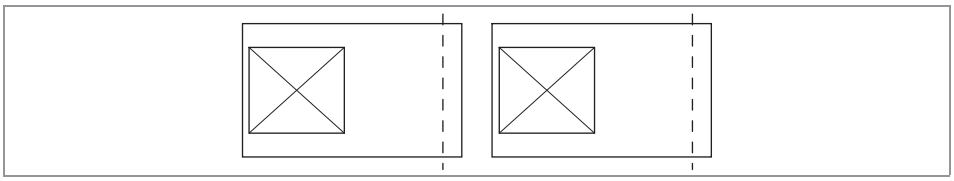


Signal from Z-Card (pin 3/4)	Signal from the external controller (pin 1/2)
High (packages ready for transfer)	High (zone is open, packages can be fed in)

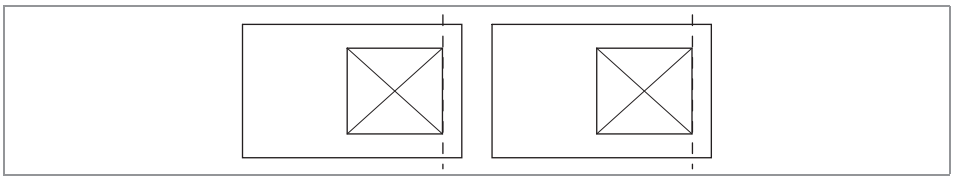


Signal from Z-Card (pin 3/4)	Signal from the external controller (pin 1/2)
High (packages ready for transfer)	High (zone is open, packages can be fed in)

As soon as the external controller switches from High to Low, the Z-Card disables the motor and waits for a new "free" signal from the downstream machine.



Signal from Z-Card (pin 3/4)	Signal from the external controller (pin 1/2)
Low (no packages present)	Low (zone is occupied, no new packages can be fed in)



Signal from Z-Card (pin 3/4)	Signal from the external controller (pin 1/2)
High (packages ready for transfer)	Low (zone is occupied, no new packages can be fed in)

For the junction and diverter, the corresponding UP or DOWN logic applies depending on whether it is an upstream or downstream unit.

Sensor 1 - 6

Pin	Function	Wire color in connecting cable
1	Not connected	
2	V_{Sensor}: Supply voltage (via polarity diode)	brown
3	PNP setting: Sensor signal default low active (when detecting an object) • $U_{Sensor\ output}$ = 0 VDC if object detected • $U_{Sensor\ output}$ = 24 VDC if no object detected NPN setting: Sensor signal default low active (when detecting an object) • $U_{Sensor\ out}$ connected to ground when sensor is free • $U_{Sensor\ out}$ not connected to ground when sensor is detecting object	black
4	Ground	blue

Only the sensors mentioned below may be chosen to ensure a fail-safe operation in case of cable rupture or sensor damage: (power supply for sensor from the board is maximal 300 mA for all sensors)

- NPN light barrier (reflector required) - active if light is reflected, open when in idle state
- NPN retro-reflective sensor (no reflector) - active if light is reflected, closed when in idle state
- PNP light barrier (reflector required) - active if light is reflected, open when in idle state
- PNP retro-reflective sensor (no reflector) - active if light is reflected, closed when in idle state

For certain applications, an inverted signal is required for sensor 5 (start sensor). This can be set with the sensor 5 inversion switch (*see page 22*).

Motor 1 - 4

Connection of a 24-VDC motor (electronically commutated).

There are two Motor1 and Motor2 connections. The signals of ever other connection are identical to the those of the respective main connection. This makes it possible to connect two motors that are always to react the same here.

Pin	RollerDrive EC1xx		RollerDrive EC200 / EC300 (13:1) / EC310	
	Function DC-EC100 and HC-EC1xx	**Pin[1)]**	**Function EC200 / EC300 (13:1) / EC310**	**Pin[2)]**
1	No error	4	No error	4
2	Not connected		Not connected	
3	FWD	6	FWD/REV	2
4	REV	5	Not connected	
5	Not connected		Not connected	
6	Rotational speed output (analog 0...5 V)	8	Rotational speed output (analog 0...10 V)	5
7	24 VDC supply voltage for motor	1	24 VDC supply voltage for motor	1
8	Ground	2	Ground	3

[1)] Corresponding pin at connected DriveControl.
[2)] Corresponding pin at connected RollerDrive motor connector.
For details see DriveControl/RollerDrive manual.

CAN bus 1 - 2

Connection for the CAN bus:

CAN1A	Signal to/from upstream module
CAN1B	Signal to/from downstream module
CAN2	Signal to/from branch [1)]

Pin	Function	Wire color in connecting cable
1	CAN low (dominant low)	white
2	CAN high (dominant high)	brown

The CAN bus is a serial, 2-strand differential bus with a baud rate of 250 kbps and ISO 11898-compliant termination. CAN highs-peed in compliance with ISO 11898-2 is used. The cable length of a physical bus must not exceed 130 m. For details *see "CAN bus communication", page 46* and *see "CAN bus connection", page 55*.

[1)] The CAN2 connection is provided for easy branching the CAN bus on the merger/diverter modules. A completely new CAN bus that is physically separated from CAN1 begins here. Here, the Z-Card serves as a repeater that sends and receives all notifications received by the CAN1 bus to the CAN2 bus. As a result, this creates a logical CAN bus consisting of multiple physical CAN buses.

- Each time a notification is sent from CAN1 to CAN2 or vice versa, there is an average delay of about 1 ms.
- The maximum bus utilization in a logical CAN bus should not exceed 1000 notifications per second.

Power supply 1 - 2

Connection of a 24 VDC power supply unit.

The Z-Card has two connections for the power supply and can therefore be supplied with power in two different ways:

- Power supply only via main power supply:
  Both the motors and the electronics are supplied with power. If this voltage drops out or is actively switched off, the entire Z-Card, including motors, sensors and control logic will not have power.
- Power supplied via the main and control voltage supply:
  The motors are supplied with power via the main power supply, while the electronics (including control logic and sensors) are powered via the control power supply. This allows the motor voltage to be switched off at any time (e.g. by an the emergency stop), without cutting power to the the electronics (including control logic and sensors). A master controller can therefore access the state of the controller (e.g. CAN bus), even if the emergency stop function is active.

NOTICE

Damage to the Z-Card due to overvoltage.

➢ Do not connect more than 24 V.

Multiple Z-Cards in sequence can be connected to a power supply unit. The maximum current of the power supply unit must be sufficient for this.

NOTICE

The power supply pins are not protected against incorrect polarity connection.

Damage to the Z-Card.

➢ Ensure the correct polarity.

Pin	Function
1	24 VDC
2	Ground or 0 VDC

Error output

The error output produces a signal as long as there is no error pending in the Z-Card.

Pin	Function	Wire color in connecting cable
1	Optocoupler output, digital output, status notification	green
2	Optocoupler, external +24 V feeder point	white

Signal	Meaning
High	No error in the Z-Card
Low	Error pending in the Z-Card.

Rotary and dip switches

ID rotary switch

The three rotary switches ID1, ID2 and ID3 are used to define a unique ID of the Z-Card based on the following formula:

ID = ID1 x 100 + ID2 x 10 + ID3

This ID is used to address the Z-Card directly via the CAN bus.

The master of the CAN bus should be assigned the ID 1000.
If a Z-Card is assigned the ID 000, it works without being connected to the CAN bus.

Speed rotary switch

The speed on the Z-Card is set using a rotary switch. The resulting speed depends on which RollerDrive is being used:

Speed setting rotary switch	EC1xx [% of rated speed]	EC310 (12:1) [m/s]	EC310 (16:1) [m/s]	EC310 (24:1) [m/s]	EC310 (36:1) [m/s]	EC310 (48:1) [m/s]	EC310 (64:1) [m/s]	EC310 (96:1) [m/s]
0	**100**	**1.31**	**0.98**	**0.65**	**0.44**	**0.33**	**0.25**	**0.16**
9	95	1.17	0.88	0.59	0.39	0.29	0.22	0.15
8	85	1.03	0.77	0.52	0.34	0.26	0.19	0.13
7	80	0.89	0.67	0.45	0.30	0.22	0.17	0.11
6	70	0.76	0.57	0.38	0.25	0.19	0.14	0.09
5	60	0.62	0.46	0.31	0.21	0.15	0.12	0.08
4	50	0.48	0.36	0.24	0.16	0.12	0.09	0.06
3	45	0.34	0.26	0.17	0.11	0.09	0.06	0.04
2	40	0.20	0.15	0.10	0.07	0.05	0.04	0.03
1	30	0.07	0.05	0.03	0.02	0.02	0.01	0.01

Default settings are shown in **bold**.

Program rotary switch

The required operating mode of the Z-Card can be set with the program rotary switch. The programs are divided into four ranges, which can be set using dip switch 1 and 2 (*see "Program range selector switch (dip switch 1 + 2)", page 22*).

The following table lists the available programs and the appropriate switch positions.

Rotary switch	Dip switch 1: OFF Dip switch 2: OFF	Dip switch 1: ON Dip switch 2: OFF	Dip switch 1: OFF Dip switch 2: ON	Dip switch 1: ON Dip switch 2: ON
0	Relay module	Relay module fwd/rev	Relay module transfer	Placeholder
1	1-zone ZPA conveyor with start/stop 4 s	1-zone ZPA conveyor with start/stop 20 s	1-zone block conveyor with train release start/stop 4 s	1-zone conveyor LPA 4 s
2	2-zone ZPA conveyor with start/stop 4 s	2-zone ZPA conveyor with start/stop 20 s	2-zone ZPA conveyor with train release start/stop 4 s	2-zone conveyor LPA 4 s
3	3-zone ZPA conveyor with start/stop 4 s	3-zone ZPA conveyor with start/stop 20 s	3-zone train release conveyor with start/stop 4 s	3-zone conveyor LPA 4 s
4	4-zone ZPA conveyor with start/stop 4 s	4-zone ZPA conveyor with start/stop 20 s	4-zone train release conveyor with start/stop 4 s	4-zone conveyor LPA 4 s
5	—	—	—	—
6	—	—	—	—
7	45° merge ZPA	90° merge from UP or SIDE to DOWN without lift/belt	45° merge train release	—
8	45° diverter ZPA	—	45 ° diverter train release	—
9	Transfer 4 ways 50 ms	Transfer 4 ways 100 ms	—	—
A	90° merge from UP or SIDE to DOWN ZPA 50 ms	90° merge from UP or SIDE to DOWN ZPA 100 ms	90° merge from UP or SIDE to DOWN train release 50 ms	90° merge from UP or SIDE to DOWN train release 100 ms
B	90° merge from UP or SIDE1 to SIDE2 ZPA 50 ms	90° merge from UP or SIDE1 to SIDE2 ZPA 100 ms	90° merge from UP or SIDE1 to SIDE2 train release 50 ms	90° merge from UP or SIDE1 to SIDE2 train release 100 ms
C	90° merge from SIDE1 or SIDE2 to DOWN ZPA 50 ms	90° merge from SIDE1 or SIDE2 to DOWN ZPA 100 ms	—	—
D	90° diverter from UP to SIDE or DOWN ZPA 50 ms	90° diverter from UP to SIDE or DOWN ZPA 100 ms	90° diverter from UP to SIDE or DOWN train release 50 ms	90° diverter from UP to SIDE or DOWN train release 100 ms
E	90° diverter from UP to SIDE1 or SIDE2 ZPA 50 ms	90° diverter from UP to SIDE1 or SIDE2 ZPA 100 ms	—	—
F	90° diverter from SIDE1 to SIDE2 or DOWN ZPA 50 ms	90° diverter from SIDE1 to SIDE2 or DOWN ZPA 100 ms	90° diverter from SIDE1 to SIDE2 or DOWN train release 50 ms	90° diverter from SIDE1 to SIDE2 or DOWN train release 100 ms

Description of programs *see page 26 ff*.
Meaning of the abbreviations *see page 60*.

Program range selector switch (dip switch 1 + 2)

The programs are divided into four ranges, which can be set using dip switch 1 and 2.

Program section	Dip switch 1	Dip switch 2
0 - F	OFF	OFF
10 - 1F	ON	OFF
20 - 2F	OFF	ON
30 - 3F	ON	ON

NPN/PNP switch (dip switch 3)

The Z-Card allows the connection of both PNP and NPN sensors. The switch must be set depending on the sensor being used.

⚠ CAUTION

Setting the switch incorrectly can cause the direction of rotation and the starting behavior to change.
Risk of injury due to malfunction and accidental motor starts

➢ Ensure correct setting.

Type of sensor	Position of switch
PNP	OFF
NPN	ON

This switch position does not change the output potential of other interfaces.

FWD/REV switch (dip switch 4)

Changes the direction of travel for all connected motors simultaneously.

Direction of travel	Position of switch
Standard (left to right, seen from the cable end; cw rotation of rollers)	OFF
Reverse (right to left, seen from the cable end; ccw rotation of rollers)	ON

The switch position does not influence the conveyor logic, that means motor- and sensor-assignment remains unaffected.

If necessary, the direction of travel for the individual drives can be changed via wiring or the installation position of the RollerDrive.

Sensor 5-inverter switch (dip switch 5)

Inverts the signal of sensor 5. In order to use sensor 5 as the **start sensor** for a zero pressure conveyor, the sensor signal has to be inverted. At **Merger and diverter modules** the sensor input must not be inverted.

Sensor 5 signal	Position of switch
Normal	OFF
Inverted	ON

Motor type (dip switch 6)

Sets the type of RollerDrive that can be connected to the Z-Card. There is a different speed control and error output depending on the type of RollerDrive.

Connected RollerDrive	Position of switch
EC100 or EC310	OFF
EC200/300	ON

Output motor fault (dip switch 7)

Sets whether motor errors (RollerDrive error) as well as the error messages of the Z-Card should be issued on the error output.

Motor error output	Position of switch
Motor fault are not output	OFF
Motor fault are not output	ON

RollerDrives that are not connected would also trigger a motor fault. Therefore, the CAN ID (*see "ID rotary switch", page 20*) can be used to select which motors are monitored:

CAN-ID	Monitored motors
1	Motor 1
2	Motors 1 and 2
3	Motors 1 to 3
4	Motors 1 to 4

ZoneControl (dip switch 8)

Sets the type of handshake for external interfaces.

Handshake	Position of switch
Modified for connection with Z-Card or external interfaces to UP, DOWN, SIDE1 and SIDE2	OFF
Modified for connection with ZoneControl to UP, DOWN and SIDE1 (not SIDE2)	ON

Dip switch 9 + 10

Currently not in use, **must** be set to **OFF.**

CAN terminator switch

Sets the CAN terminator resistance at the end of the CAN bus line. The terminator resistance has to be set for Z-Cards at the end of the CAN bus line.

CAN bus termination	Position of switch
Not terminated	Left
Terminated	Right

LEDs

UP / DOWN / SIDE

Each UP / DOWN / SIDE1 / SIDE2 interface has two LEDs:
- yellow LED: indicates the status of the respective partner.
- green LED: indicates the status of the Z-Card.

The meanings of the LEDs differ depending on whether it is the interface to an upstream or downstream zone:

LED		Interface to	
		upstream zone	**downstream zone**
Yellow	on	Upstream zone is occupied.	Downstream zone is clear.
	Off	Upstream zone is clear.	Downstream zone is occupied.
Green	on	Z-Card is clear.	Z-Card is occupied.
	Off	Z-Card is occupied.	Z-Card is clear.

PLC 1 - 4

There are two LEDs for each interface, PLC1 through PLC4:
- yellow LED: indicates the status of the respective input.
- green LED: indicates the status of the respective out.

LED		Meaning
Yellow	on	A HIGH signal is pending at the input.
	Off	A LOW signal is pending at the input.
Green	on	A HIGH signal is pending at the output.
	Off	A Low signal is pending at the output.

Sensor 1 - 6

Sensors 1 to 6 each have one LED (yellow) displaying the status of the respective sensor:
- On: Sensor 1 is clear.
- Off: Sensor 1 is occupied.

Motor 1 - 4

Motor interfaces 1 to 4 each have one LED (yellow) displaying the status of the respective input:
- On: The speed output of the motor plug is energized (motor is running).
- Off: The speed output of the motor plug is not energized (motor is idle).

Error

The red error LED shows the error status of the Z-Card:
- On: An error has occurred.
- Off: No error has occurred.

Run

The yellow Run-LED indicates whether the Z-Card is energized:
- On: The Z-Card is properly provided with power.
- Off: No appropriate voltage is connected.

Technical specifications

Unless otherwise stated, all electrical parameters refer to an ambient temperature of 25 °C (77 °F).

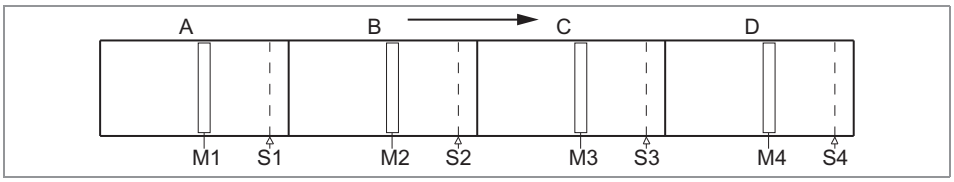
Supply voltage	24 VDC
Voltage range	23 to 27 VDC
Current consumption - unloaded - with 4 sensors, without motors	 50 mA (max. 220 mA) 120 mA
Output current per motor/actuator	max. 2 A permanent, max 8 A permanent per Z-Card
Output current per motor/actuator during braking	30 A briefly (t_{on} < 20 ms, $t_{off,\ pause}$ > 1 s)
Output current, all sensors	max. 300 mA
Output voltage per sensor	23 to 27 VDC
Output voltage per motor/actuator	23 to 27 VDC
Output voltage, PLC connector PIN 2	23 to 27 VDC
Input voltage, PLC connector PIN 3/4 (collector/emitter)	max. 40 VDC
Input current, PLC connector PIN 3/4 (collector/emitter)	max. 20 mA
Fuse	8 A, 250 V, slow, e.g. little fuse model 218008
Permissible ambient temperature	-5 °C to +40 °C (23 °F to 104 °F)
Ambient temperature changes	max. 1 °K/min; 3 h; two cycles according to IEC 68-2-14
Humidity	max. 90% not condensing
Housing material	ABS, black
Protection classification	IP54 (box, sockets, cable bushings)
Weight of Z-Card incl. box and holder	approx. 380 g (13.4 oz)
Housing dimensions (W x H x D)	35 mm x 170 mm x 85 mm (1.38 in x 6.69 in x 3.35 in)
Space requirements (installed state), including cables and holder (W x H x D)	45 mm x 200 mm x 100 mm (1.77 in x 7.87 in x 3.94 in)
Installation altitude above sea level	max. 1000 m (3300 ft)

Program descriptions

In each of the following program descriptions, the corresponding conveyor section is displayed stylized. The following symbols are used in this diagrams:

Symbol	Meaning
	Zone
	Conveyor direction
M...	Motor number
S...	Sensor number

Relay module



In this program there are four digital inputs which are used to start or stop the four motors, and four digital outputs which are used to transmit the status of the sensor to an external controller. These inputs and outputs have the following assignments:

Input	High	Low
PLC1	Motor 1 should run	Motor 1 should be idle
PLC2	Motor 2 should run	Motor 2 should be idle
PLC3	Motor 3 should run	Motor 3 should be idle
PLC4	Motor 4 should run	Motor 4 should be idle
Output		
PLC1	Sensor 1 detects object	Sensor 1 detects no object
PLC2	Sensor 2 detects object	Sensor 2 detects no object
PLC3	Sensor 3 detects object	Sensor 3 detects no object
PLC4	Sensor 4 detects object	Sensor 4 detects no object
SIDE1	Signal from sensor 5	
SIDE2	Signal from sensor 6	

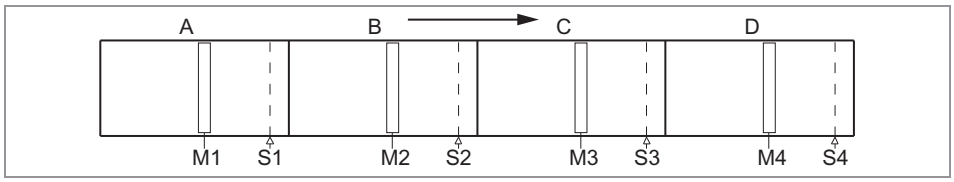
Connection		Description
Motor	M1	Motor for zone 1
	M2	Motor for zone 2
	M3	Motor for zone 3
	M4	Motor for zone 4
Sensor	S1	Sensor for zone 1
	S2	Sensor for zone 2
	S3	Sensor for zone 3
	S4	Sensor for zone 4
	S5	---

This program does not use the connections UP and DOWN or the inputs SIDE1 and SIDE2.

The program-specific bits (offset 07 h) in the CAN control word telegram (*see page 49*) have the following meanings:

Bit 0	0 = Motor 1 standard direction of rotation 1 = Motor 1 reversed
Bit 1	0 = Motor 2 standard direction of rotation 1 = Motor 2 reversed
Bit 2	0 = Motor 3 standard direction of rotation 1 = Motor 3 reversed
Bit 3	0 = Motor 4 standard direction of rotation 1 = Motor 4 reversed

Relay module FWD/REV



This program is the same to the relay module except that a delivery in both directions is possible. However, two motors are switched simultaneously in each case. The inputs and outputs have the following assignments:

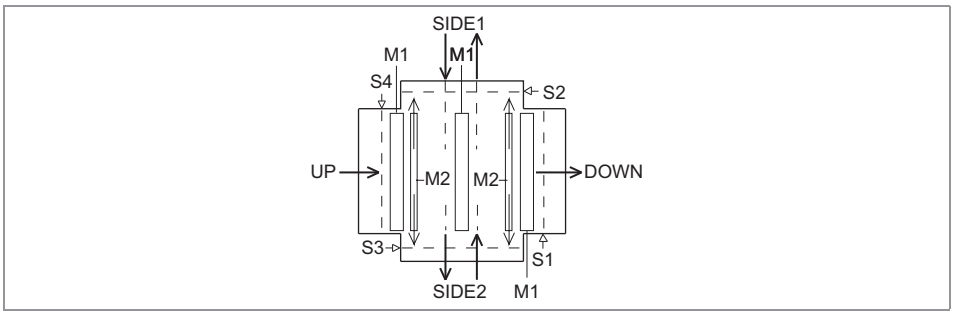
Input				Meaning
PLC1	**PLC2**	**PLC3**	**PLC4**	
Low	Low			Motors 1 and 2 should be idle
High	Low			Motors 1 and 2 should rotate clockwise
Low	High			Motors 1 and 2 should rotate counterclockwise
High	High			Motors 1 and 2 should be idle
		Low	Low	Motors 3 and 4 should be idle
		High	Low	Motors 3 and 4 should rotate clockwise
		Low	High	Motors 3 and 4 should rotate counterclockwise
		High	High	Motors 3 and 4 should be idle

Output	High	Low
PLC1	Sensor 1 detects object	Sensor 1 detects no object
PLC2	Sensor 2 detects object	Sensor 2 detects no object
PLC3	Sensor 3 detects object	Sensor 3 detects no object
PLC4	Sensor 4 detects object	Sensor 4 detects no object
SIDE1	Signal from sensor 5	
SIDE2	Signal from sensor 6	

Connection		Description
Motor	M1	Motor 1
	M2	Motor 2
	M3	Motor 3
	M4	Motor 4
Sensor	S1	Sensor 1
	S2	Sensor 2
	S3	Sensor 3
	S4	Sensor 4
	S5	—

This program does not use the connections UP and DOWN or the inputs SIDE1 and SIDE2.

Relay module transfer



This program is used to control a 90° transfer via a master controller. The inputs and outputs required for this have the following assignments:

Input	High	Low
PLC1	Motor 1 should run	Motor 1 should be idle
PLC2	Stroke (motor 3 + 4) should run until it reaches the next stop position (top or bottom) [1)]	
PLC3	see table below	
PLC4	see table below	
Output		
PLC1	Sensor 1 detects object	Sensor 1 detects no object
PLC2	Sensor 2 detects object	Sensor 2 detects no object
PLC3	Sensor 3 detects object	Sensor 3 detects no object
PLC4	Sensor 4 detects object	Sensor 4 detects no object
SIDE1	Signal from sensor 5	
SIDE2	Signal from sensor 6	

[1)] Stop position detected by sensor 5. On reaching the stop position, motor 3 stops immediately; motor 4 stops just 100 ms later. This ensures that the lift will definitely be in the current position.

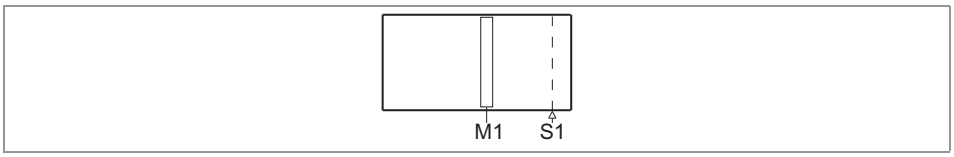
Input		Meaning
PLC3	**PLC4**	
Low	Low	Motor 2 should be idle
High	Low	Motor 2 should rotate clockwise
Low	High	Motor 2 should rotate counterclockwise
High	High	Motor 2 should be idle

Connection		Description
Motor	M1	Rollers in main transport direction
	M2	Belts in diverter direction
	M3	Lift motor 1
	M4	Lift motor 2

Connection		Description
Sensor	S1	Sensor for downstream zone (DOWN)
	S2	Sensor for merge or diverter direction (SIDE1)
	S3	Sensor for a second merge or diverter direction (SIDE2)
	S4	Sensor for upstream zone (UP)
	S5	Sensor for lift: • Sensor switches from tripped to clear: Lift is at lowest point • Sensor switches from clear to tripped: Lift is at highest point

This program does not use the connections UP and DOWN or the inputs SIDE1 and SIDE2.

Placeholder



This program is a 1-zone position that keeps its zone clear, provided that the downstream zone (DOWN) is occupied. This function can be used for fire doors or passages for personnel (lift-up gate), for example. The upstream zone (UP) receives a clear message only if this storage space and the downstream zone are clear. In all other cases, the upstream zone is given an occupied signal.

If a fire door, a lift-up gate or similar is used, this should be monitored by sensor 5. If sensor is 5 is tripped, the program switches to stop mode, which stops all motors and sends an occupied signal to the upstream zone. Once sensor 5 is clear again and the downstream zone is clear, the module is ready for a new package to be conveyed from the upstream zone.

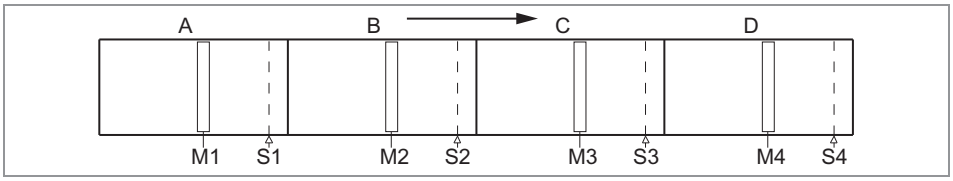
This program does not use any PLC inputs or outputs.

The connections for motors and sensors have the following assignments:

Connection		Description
Motor	M1	Rollers in main transport direction
	M2	Rollers in main transport direction
	M3	Rollers in main transport direction
	M4	Rollers in main transport direction
Sensor	S1	Sensor for downstream zone (DOWN)
	S2	—
	S3	—
	S4	—
	S5	Sensor for the fire door, lift-up gate or similar.

This program does not use the connections UP, DOWN, SIDE1 and SIDE2.

ZPA conveyor with start/stop



Depending on the program selected, only the affected sensors and motors are activated (see table below). Input and output settings are not affected.

Number of zones	Affected sensors and motors
1	S1 (for M1, M2, M3, M4)
2	S1 (for M1, M3), S2 (for M2, M4)
3	S1 (for M1), S2 (for M2), S3 (for M3)
4	S1 (for M1), S2 (for M2), S3 (for M3), S4 (for M4)

In these programs, the Z-Card module operates as a conveyor with one, two, three or four zones and the possibility of stopping each zone via PLC input.

A zone that has been stopped in this way does not transport the package further to the sensor, even if the downstream zone is free. The package is transported further only once the stop signal has been cleared.

If a package that has been stopped is removed or pushed back manually, the motor is activated for a maximum of 1 second to transport the package back to the sensor. If the pakkage does not reach the sensor within this time, the Z-Card switches to the "clear" state. Therefore, if the "occupied" status of a zone remains, the package must not be pushed back any further than it is transported for 1 second (distance depends on the conveying speed, *see page 20*).

Package transport is monitored by timers. After a timeout of approx. 4 or 20 seconds (depending on the program selected), the Z-Card switches to "error" and generates an error signal. As long as the error signal is activated, a "zone occupied" signal is transmitted to the upstream zone. After approximately 1 second, the Z-Card switches back from this status and initializes the zone (in the same way as after a power failure). If a package that is in transit still cannot be transported properly, the Z-Card switches back to error status again after timing out.

If a transported package is removed manually, the Z-Card switches to the "clear" status after 4 or 20 seconds.

⚠ WARNING

Accidental motor starts
If sensor 5 is not connected, the starting signal remains on permanently.

Risk of pinched fingers.

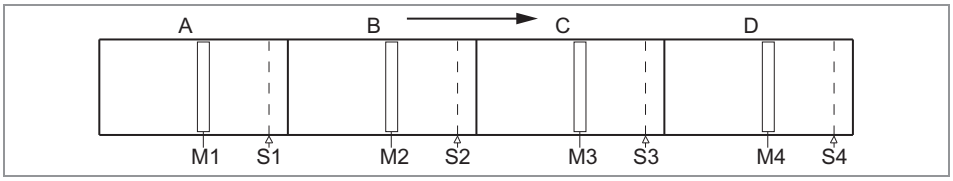
➢ Invert the signal from sensor 5 with the sensor 5 inversion switch.

The inputs and outputs have the following assignments:

Input	High	Low
PLC1	Package is stopped in zone 1.	Package is transported normally in zone 1.
PLC2	Package is stopped in zone 2.	Package is transported normally in zone 2.
PLC3	Package is stopped in zone 3.	Package is transported normally in zone 3.
PLC4	Package is stopped in zone 4.	Package is transported normally in zone 4.
Output		
PLC1	Sensor 1 detects object	Sensor 1 detects no object
PLC2	Sensor 2 detects object	Sensor 2 detects no object
PLC3	Sensor 3 detects object	Sensor 3 detects no object
PLC4	Sensor 4 detects object	Sensor 4 detects no object

Connection		Description
Motor	M1	Motor for zone 1
	M2	Motor for zone 2
	M3	Motor for zone 3
	M4	Motor for zone 4
Sensor	S1	Sensor for zone 1
	S2	Sensor for zone 2
	S3	Sensor for zone 3
	S4	Sensor for zone 4
	S5	Start signal for zone 1 (optional). This can be used, for example, for manual placement of a package if there is no upstream system. For operation, the signal from this sensor must be inverted (see warning above).

Train release conveyor with start/stop



Depending on the program selected, only the affected sensors and motors are activated (see table below). Input and output settings are not affected.

Number of zones	Affected sensors and motors
1	S1 (for M1, M2, M3, M4)
2	S1 (for M1, M3), S2 (for M2, M4)
3	S1 (for M1), S2 (for M2), S3 (for M3)
4	S1 (for M1), S2 (for M2), S3 (for M3), S4 (for M4)

In these programs, the Z-Card module operates as a conveyor with train release with one, two, three or four zones, respectively. This mode corresponds to that of a standard conveyor (*see page 32*) except that a "clear" signal is sent to the upstream module as soon as the module starts transporting the package to the downstream module. In this way a longer row of accumulated packages is transported almost simultaneously.

WARNING

Accidental motor starts
If sensor 5 is not connected, the starting signal remains on permanently.

Risk of pinched fingers.

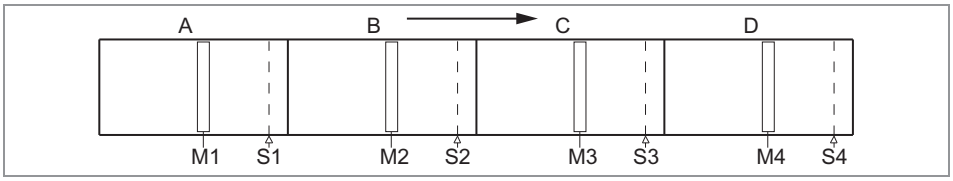
- Invert the signal from sensor 5 with the sensor 5 inversion switch.

Input	High	Low
PLC1	Package is stopped in zone 1.	Package is transported normally in zone 1.
PLC2	Package is stopped in zone 2.	Package is transported normally in zone 2.
PLC3	Package is stopped in zone 3.	Package is transported normally in zone 3.
PLC4	Package is stopped in zone 4.	Package is transported normally in zone 4.
Output		
PLC1	Sensor 1 detects object	Sensor 1 detects no object
PLC2	Sensor 2 detects object	Sensor 2 detects no object
PLC3	Sensor 3 detects object	Sensor 3 detects no object
PLC4	Sensor 4 detects object	Sensor 4 detects no object

The connections for motors and sensors have the following assignments:

Connection		Description
Motor	M1	Motor for zone 1
	M2	Motor for zone 2
	M3	Motor for zone 3
	M4	Motor for zone 4
Sensor	S1	Sensor for zone 1
	S2	Sensor for zone 2
	S3	Sensor for zone 3
	S4	Sensor for zone 4
	S5	Start signal for zone 1 (optional). This can be used, for example, for manual placement of a package if there is no upstream system. For operation, the signal from this sensor must be inverted (see warning above).

LPA conveyor



Depending on the program selected, only the affected sensors and motors are activated (see table below). Input and output settings are not affected.

Number of zones	Affected sensors and motors
1	S1 (for M1, M2, M3, M4)
2	S1 (for M1, M3), S2 (for M2, M4)
3	S1 (for M1), S2 (for M2), S3 (for M3)
4	S1 (for M1), S2 (for M2), S3 (for M3), S4 (for M4)

The operation of these programs corresponds to that of the ZPA conveyor (*see page 32*) except that the packages are conveyed with low pressure accumulation.

In this mode the Z-Card module operates as a standard conveyor as long as packages are conveyed without stops. When the downstream zone and the own zone are occupied, the upstream zone will still receive a "clear" signal for 2.5 seconds (after the own sensor has detected the package). During this time, the own motor runs at half speed. If the downstream zone does not send a "clear" signal within this time, an "occupied" signal is then sent to the upstream zone to avoid receiving more packages. If the downstream zone sends a free signal, the packages are conveyed and separated (provided that there is a gap of at least 15 ms between the packages).

After the last LPA zone, there should be three or four standard zones to ensure a full separation of the packages.

This program does not use any PLC inputs or outputs.

WARNING

Accidental motor starts
If sensor 5 is not connected, the starting signal remains on permanently.

Risk of pinched fingers.

- Invert the signal from sensor 5 with the sensor 5 inversion switch.

The connections for motors and sensors have the following assignments:

Connection		Description
Motor	M1	Motor for zone 1
	M2	Motor for zone 2
	M3	Motor for zone 3
	M4	Motor for zone 4
Sensor	S1	Sensor for zone 1
	S2	Sensor for zone 2
	S3	Sensor for zone 3
	S4	Sensor for zone 4
	S5	Start signal for zone 1 (optional). This can be used, for example, for manual placement of a package if there is no upstream system. For operation, the signal from this sensor must be inverted (see warning above).

Merge

A merge always has two upstream zones and a downstream zone. The path that should be taken can be determined by a master controller (e.g. PLC) via inputs PLC2 and PLC3.

If a package exits the module, the Z-Card switches the output PLC1 to "High", signaling to the master controller that it is ready for a new signal. Once a new package is accepted, the Z-Card switches the output PLC1 back to "Low". The signal currently pending at inputs PLC2 and PLC3 will be applied to the next package:

PLC2	PLC3	Meaning
Low	Low	No package is accepted. Any incoming packages will remain in front of the module.
High	Low	The package is transported in the main transport direction (no merging).
Low	High	The package is merged.
High	High	Alternating conveying and jam prevention: The Z-Card attempts to transport packages alternately from both upstream zones. However, if the intended upstream zone is clear and the other upstream zone is occupied, the package is transported from the other upstream zone.

The input PLC4 helps determine whether or not the package should be transported onward from the merger module. The output PLC4 receives the signal indicating whether there is a package at the sensor located at the end of the module.

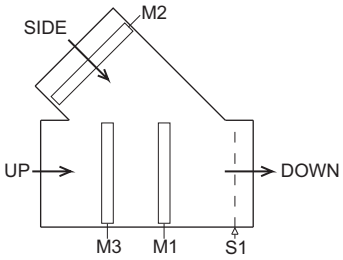
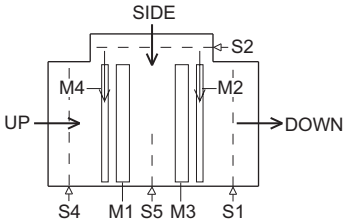
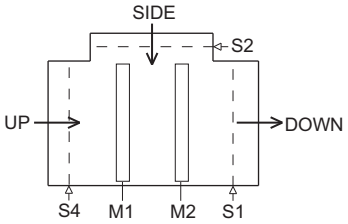
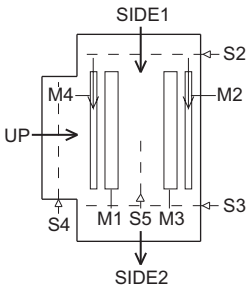
PLC4	High	Low
Input	The package should be stopped at the end of merger module.	The package can exit the merger module.
Output	A package is located at the sensor at the end of merger module.	No package located at the sensor.

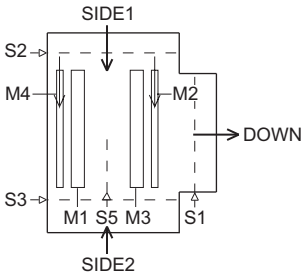
The connections for motors and sensors have the following assignments:

Connection		Description
Motor	M1	Rollers in main transport direction
	M2	Belts in merge direction
	M3	For 45° merge: same as motor 1 For 90° merge: Lift motor 1
	M4	For 45° merge: same as motor 2 For 90° merge: Lift motor 2

Connection		Description
Sensor	S1	Sensor for downstream zone (DOWN)
	S2	Sensor for merge direction (SIDE1)
	S3	Sensor for a second merge or diverter direction (SIDE2)
	S4	Sensor for upstream zone (UP)
	S5	Sensor for lift: • Sensor switches from tripped to clear: Lift is at lowest point • Sensor switches from clear to tripped: Lift is at highest point

The following types of mergers are available:

Program	Structure	Sensors used	Types
45° merge		S1	• ZPA • Train release
90° merge from UP or SIDE to DOWN		S1 S2 S4 S5	• ZPA 50 ms • ZPA 100 ms • Train release 50 ms • Train release 100 ms
90° merge from UP or SIDE to DOWN without lift/belt		S1 S2 S4	
90° merge from UP or SIDE1 to SIDE2		S2 S3 S4 S5	• ZPA 50 ms • ZPA 100 ms • Train release 50 ms • Train release 100 ms

Program	Structure	Sensors used	Types
90° merge from SIDE1 or SIDE2 toDOWN		S1 S2 S3 S5	• ZPA 50 ms • ZPA 100 ms

Types:

- ZPA: zero pressure accumulation. A "clear" signal is sent to the upstream module once the package has left the module.
- Train release: a "clear" signal is sent to the upstream module once the module starts transporting the package to the downstream module and a new package can be safely fed in.
- 50 ms / 100 ms: Delay of the rollers after detecting the trailing edge of the package. This delay time serves to ensure that the package has been completely transported past the sensor before it merged.

Diverter

A diverter always has one upstream zone and two downstream zones. The path that should be taken can be determined by a master controller (e.g. PLC) via inputs PLC2 and PLC3.

If a package exits the module, the Z-Card switches the output PLC1 to "High", signaling to the master controller that it is ready for a new signal. Once a new package is accepted, the Z-Card switches the output PLC1 back to "Low". The signal currently pending at inputs PLC2 and PLC3 will be applied to the next package:

PLC2	PLC3	Meaning
Low	Low	No package is accepted. Any incoming packages will remain in front of the module.
High	Low	The package is transported in the main transport direction (no diverting).
Low	High	The package is ejected.
High	High	Alternating conveying and jam prevention: The Z-Card attempts to transport packages alternately to both downstream zones. However, if the intended downstream zone is occupied, and the other downstream zone is free, the package is transported to the other downstream zone. If both downstream zones are occupied, the package travels up to the sensor of the originally intended zone.

The input PLC4 helps determine whether or not the package should be transported onward from the diverter module. The output PLC4 receives the signal indicating whether there is a package at the sensor located at the end of the module:

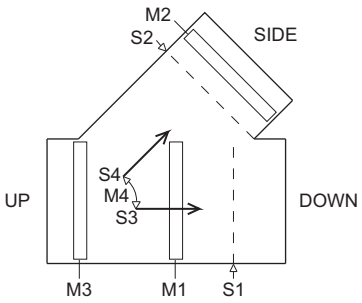
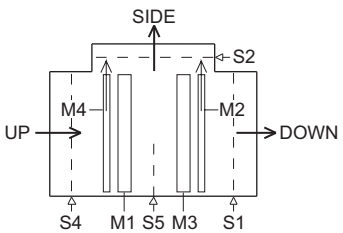
PLC4	High	Low
Input	The package should be stopped on the end of diverter module.	The package can exit the diverter module.
Output	A package is located at the sensor on the end of diverter module.	No package located at the sensor.

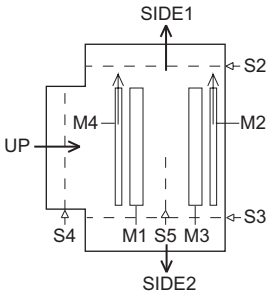
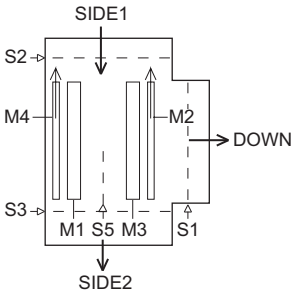
The connections for motors and sensors have the following assignments:

Connection		45° diverter	90° diverter
Motor	M1	Pop-up rollers in main transport direction	Rollers in main transport direction
	M2	Rollers in diverter direction	Belts in diverter direction
	M3	Rollers in main transport direction	Lift motor 1
	M4	Rotating motor for pop-up rollers	Lift motor 2

Connection		45° diverter	90° diverter
Sensor	S1	Sensor for downstream zone (DOWN)	
	S2	Sensor for merge or diverter direction (SIDE1)	
	S3	Sensor in straight direction of travel (DOWN) for rotation of the pop-up rollers	Sensor for second diverter direction (SIDE2)
	S4	Sensor in diverter direction (SIDE) for rotation of the pop-up rollers	Sensor for upstream zone (UP)
	S5	—	Sensor for lift: • Sensor switches from tripped to clear: Lift is at lowest point • Sensor switches from clear to tripped: Lift is at highest point
	S6	Sensor for position monitoring. After initializing the Z-Card, if a package is located in the diverter, the system waits until a signal is received at inputs PLC2 and PLC3 indicating where the package should be transported.	

The following types of diverters are available:

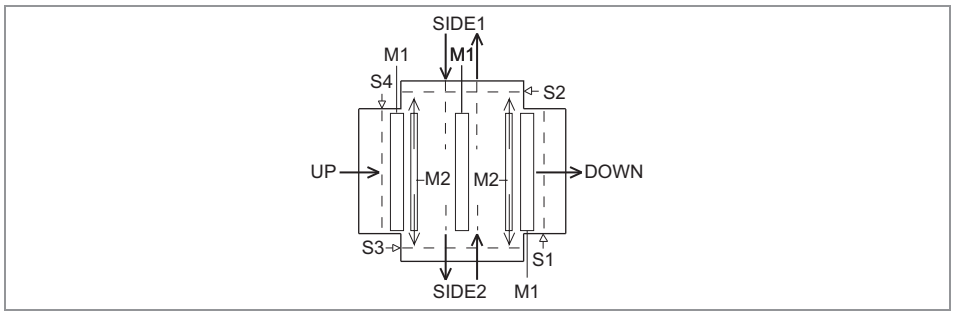
Program	Structure	Sensors used	Types
45° diverter		S1 S2 S3 S4	• ZPA • Train release
90° diverter from UP to SIDE or DOWN		S1 S2 S4 S5 S6	• ZPA 50 ms • ZPA 100 ms • Train release 50 ms • Train release 100 ms

Program	Structure	Sensors used	Types
90° diverter from UP to SIDE1 or SIDE2		S2 S3 S4 S5 S6	• ZPA 50 ms • ZPA 100 ms • Train release 50 ms • Train release 100 ms
90° diverter from SIDE1 toSIDE2 orDOWN 50 ms		S1 S2 S3 S5 S6	• ZPA 50 ms • ZPA 100 ms

Types:

- ZPA: zero pressure accumulation. A "clear" signal is sent to the upstream module once the package has left the module.
- Train release: a "clear" signal is sent to the upstream module once the module starts transporting the package to the downstream module and a new package can be safely fed in.
- 50 ms / 100 ms: Delay of the rollers after detecting the trailing edge of the package. This delay serves to ensure that the package has been completely transported past the sensor before it is ejected.

4-way transfer



The 4-way transfer allows products to be merged or ejected in two directions or to be transported onwards in the main direction of travel. The path that should be taken can be determined by a master controller (e.g. PLC) via inputs PLC1 to PLC3.

If a package exits the module, the Z-Card switches the output PLC1 to "High", signaling to the master controller that it is ready for a new signal. Once a new package is accepted, it switches the output PLC1 back to "Low". The signal currently pending at inputs PLC1 to PLC3 will be applied to the next package:

Input			Meaning
PLC1	**PLC2**	**PLC3**	
Low	Low	Low	The Z-Card sends an "occupied" message to all upstream zone and waits for the merger/diverter setting.
Low	Low	High	Package to be transported from UP to DOWN.
Low	High	Low	Package to be transported from UP to SIDE1.
Low	High	High	Package to be transported from UP to SIDE2.
High	Low	Low	Package to be transported from SIDE1 to DOWN.
High	Low	High	Package to be transported from SIDE1 to SIDE2.
High	High	Low	Package to be transported from SIDE2 to DOWN.
High	High	High	Package to be transported from SIDE2 to SIDE1.

Input PLC4 and outputs PLC2 to PLC4 are not used.

The connections for motors and sensors have the following assignments:

Connection		Description
Motor	M1	Rollers in main transport direction
	M2	Belts in diverter direction
	M3	Lift motor 1
	M4	Lift motor 2

Connection		Description
Sensor	S1	Sensor for downstream zone (DOWN)
	S2	Sensor for first merge or diverter direction (SIDE1)
	S3	Sensor for a second merge or diverter direction (SIDE2)
	S4	Sensor for upstream zone (UP)
	S5	Sensor for lift: • Sensor switches from tripped to clear: Lift is at lowest point • Sensor switches from clear to tripped: Lift is at highest point
	S6	Sensor for position monitoring. After initializing the Z-Card, if a package is located in the module, the system waits until a signal is received at inputs PLC1, PLC2 and PLC3 indicating where the package should be transported.

A delay after detecting the trailing edge of the package serves to ensure the package has been completely transported past the sensor before it is merged or ejected. Depending on the program selected, this delay is 50 ms or 100 ms.

CAN bus communication

This chapter describes the underlying communication between a Z-Card and another system (e.g. a PC) via the CAN bus.

The data exchange between a Z-Card and a partner is made via dispatch and receipt of data telegrams, which have the structures described as follows. Each Z-Card must have a unique ID in order to address the telegrams. Al telegrams sent by the Z-Card have a CAN-ID matching the configured Z-Card-ID. All telegrams sent by the master (e. g. PLC) must have a CAN-ID corresponding to the value of the Z-Card-ID increased by 1000.

Example: If the ID 25 is set on a Z-Card, the Z-Card sends all of its messages (e. .g. CAN status word telegram) with the CAN-ID 25. A master must send all of these messages (e. g. CAN control word telegram) to this Z-Card with the CAN-ID 1025. The exception to this, however, is the telegram "host system active", which uses CAN-ID 1000 when sending messages.

Information on connecting the CAN bus *see page 55*.

General telegram structure

Every telegram is generally transferred as an 8 byte telegram. Two bytes are reserved for the control code and one byte for the counter, respectively. The remaining five bytes can contain data. If not all five bytes are used (depending on the structure), the rest are occupied with the 0FFh signs.

Offset	Byte information
00h	Control code
01h	
02h	Reserved
03h	Data (depending on the message code)
04h	
05h	
06h	
07h	

Control code

The control code is represented as a 16 bit value in the Big Endian format and contains the following information:

Bit	Description
0 - 9	Contains the ID of the Z-Card to which the telegram is to be sent or from which the telegram originates.
10 - 12	Identifies the length of the telegram without the control word.
13 - 14	Identifies the message type: • Error telegram: bit 13 = 0, bit 14 = 0 • Up/Down information: bit 13 = 1, bit 14 = 0 • Reserved: bit 13 = 0, bit 14 = 1 • Other telegrams: bit 13 = 1, bit 14 = 1
15	Defines whether the message was initiated by the Z-Card or the host: • Message from the Z-Card: bit 15 = 1 • Message of host system: bit 15 = 0

Example: Error message from ID 25 = 1 00 010 0000011001 = 8819h

Data

The data bytes contain the actual data of the message. The structure of the data depends on the type of message.

Error telegram

In case of error (motor error or error through state table), an error telegram is generated by the Z-Card. The four motor states and the actual state number are output as reference data.

Byte information	Offset	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Motor state 1 = motor on (bit 4-7) or error pending (bits 0-3) 0 = motor off (bit 4-7) or no error (bits 0-3)	03h	Motor 4 off/on	Motor 3 off/on	Motor 2 off/on	Motor 1 off/on	Motor 4 error no/yes	Motor 3 error no/yes	Motor 2 error no/yes	Motor 1 error no/yes
State number	04h								

CAN status word telegram

The telegram CAN status word is sent from a Z-Card each time the state of a sensor changes or at least every 250 milliseconds. As soon as there is a change in the program-specific byte, the CAN status word is sent with every change.

The CAN status word telegram contains the following information:

- **Sensor information:** shows the sensor signals currently used. Every sensor is represented by one bit.
  Unconnected sensors are shown as interrupted.
- **Motor information:** indicates whether the motors are active (forward/reverse) and whether or not an error is pending. Every motor is represented by one bit.
- **PLC information:** shows the current state of the logical PLC inputs and physical PLC outputs connected to the module. With the PLC inputs, the physical signal is logically connected by way of a an "OR" to the value provided by the CAN status word telegram.
- **Program-specific information:** see table below

Byte information	Offset	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Type of telegram	03h	0 (= CAN status word)							
Sensor information 1 = Sensor is interrupted 0 = Sensor is not interrupted	04h	-	-	Sensor 6	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Sensor 1
Motor information	05h	Motor 4 error	Motor 3 error	Motor 2 error	Motor 1 error	Motor 4	Motor 3	Motor 2	Motor 1
		1 = motor error or not connected 0 = no motor error				1 = motor is running 0 = motor is braking or free-running			
PLC information 1 = input/output high 0 = input/output low	06h	Out 4	Out 3	Out 2	Out 1	In 4	In 3	In 2	In 1
Program-specific information	07h	SIDE2[1)]	SIDE1[1)]	DOWN[1)]	UP[1)]	program-specific			

[1)] The value of the bit differs depending on whether it is the interface to an upstream or downstream zone:

Bit	Interface to	
	upstream zone	downstream zone
1	Z-Card is clear.	Z-Card is occupied.
0	Z-Card is occupied.	Z-Card is clear.

CAN control word telegram

The CAN control word telegram is sent by a host system (e. g. PC/PLC) to a Z-Card to influence its behavior (bit 13 and 14 of the control word = 1).

The CAN control word telegram contains the following information:

- **PLC input information:** The PLC input signals that are currently applied to the module can be bypassed with this byte. When the input bit is set to 1, the Z-Card works independently of the actual signal as if the PLC signal were HIGH. If the bit is set to 0, the signal of the physical PLC input is used.
- **Logical motor speed:** The speed of each motor can be reduced without manually turning the speed potentiometer or the rotary selector. The value in this byte represents a percentage of the speed set manually. The value 0 equals 0 % of the default speed of the respective program and the value 10 equals 100 % of the speed that has been set manually.
  Thus, to reduce the speed, this byte must hold a substitute for the percentage of this reduction. The resulting speed is the speed set manually multiplied by the percentage indicated by this byte and then rounded down to a multiple of 5%. The following table shows a few sample resulting speeds:

Rotary switch	Logical motor speed			
	20%	**50%**	**80%**	**100%**
0	20%	50%	80%	100%
8	15%	40%	60%	80%
7	10%	35%	55%	70%

- **Program-specific information:** see table below

Byte information	Offset	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Type of telegram	03h	1 (= CAN control word)							
PLC input information 1 = Set PLC input to high 0 = Use physical PLC input	04h	CAN control word confirmation required (0) or not (1)	Invert (1) or do not invert (0) sensor signals	-	-	In 4	In 3	In 2	In 1
Motor speed 1/2	05h	Logical motor speed v2				Logical motor speed v1			
Motor speed 3/4	06h	Logical motor speed v4				Logical motor speed v3			
Program-specific information	07h	SIDE2[1)]	SIDE1[1)]	DOWN[1)]	UP[1)]	program-specific			

[1)] The value of the bit differs depending on whether it is the interface to an upstream or downstream zone:

Bit	Interface to	
	upstream zone	**downstream zone**
1	Upstream zone is occupied.	Downstream zone is clear.
0	Upstream zone is clear.	Downstream zone is occupied.

- Bit 13 and 14 of control word = 1
- v1 to v4 represent the M1 to M4 motor speed
- The Z-Card sends a 0Ah confirmation after receiving a CAN control word. The 4 bytes after the type of telegram contain the settings of the CAN control word message.

CAN control word confirmation

The CAN control word confirmation telegram is sent from a Z-Card to acknowledge that the CAN control word telegram has been received. The PLC data input, motor speed v1 to v4 and the function-specific data are taken from the CAN control word verification telegram and sent back again as a confirmation.

Offset	Byte information
03h	Type of telegram: 0Ah (CAN control word confirmation)
04h	Same data as with corresponding CAN control word telegram
05h	
06h	
07h	

Program change telegram

The program change telegram is sent from the host system (e.g PC/PLC) to a Z-Card in order to select a different program. The selected program will run once this telegram from the Z-Card is received. The Z-Card responds to this telegram with a confirmation telegram.

Offset	Byte information
03h	Type of telegram: 0Bh (program change telegram)
04h	Number of the new program (0 to 63)

Program change confirmation

The program change confirmation telegram is sent from a Z-Card to acknowledge that a program change telegram has been received and contains the same data.

Offset	Byte information
03h	Type of telegram: 0Ch (program change confirmation)
04h	Number of the new program (0 to 63)

Telegram host system active

The "host system active" telegram is sent from the host system (e.g. PC/PLC) to all Z-Cards at regular intervals and at the same time. The Z-Card checks the time between two telegrams. If no new telegram has been received within the specified timeframe, the Z-Card stops all motors. Once the next "host system active" telegram is received, the Z-Card returns to normal operating mode.

In order to send a telegram to all Z-Cards at the same time,the telegram must be sent width the Z-Card-ID 1000. This causes telegrams to be sent to all Z-Cards.

Offset	Byte information
03h	Type of telegram: 0Dh (host system active)
04h	HighByte timeout
05h	LowByte timeout

The time interval between two telegrams is 256 x HighByte + LowByte in milliseconds.

Transport and storage

Transport

- Every Z-Card is packaged in its own cardboard box.

⚠ CAUTION

Improper transport poses a hazard of injury.

- ➢ Transport-related tasks should only be carried out by qualified and authorized persons.
- ➢ Follow the instructions below.

- ➢ Do not stack more than four cardboard boxes on top of each other.
- ➢ Check the fixation of the Z-Cards before transport.
- ➢ Avoid serious impacts during transport.
- ➢ Check each Z-Card visually for damage after transport.
- ➢ In the event of damage, take photos of the damaged parts.
- ➢ To maintain the warranty, report any damage caused by transport instantly to the transport company and Interroll.
- ➢ Do not transfer the Z-Cards between warm and cold environments. This may cause condensing water.

Storage

⚠ CAUTION

Risk of injury due to improper storage

- ➢ Do not stack more than four carton boxes on top of each other.

- ➢ Check each Z-Card for damage after storage.

Assembly

Warnings concerning proper assembly

⚠ CAUTION

Risk of injury due to accidental motor starts

- ➢ Assembly may only be executed by qualified and authorized persons.
- ➢ Disconnect all power before assembling the Z-Card. Ensure that the conveyor cannot be turned on accidentally.
- ➢ Use caution while assembling the Z-Card.

NOTICE

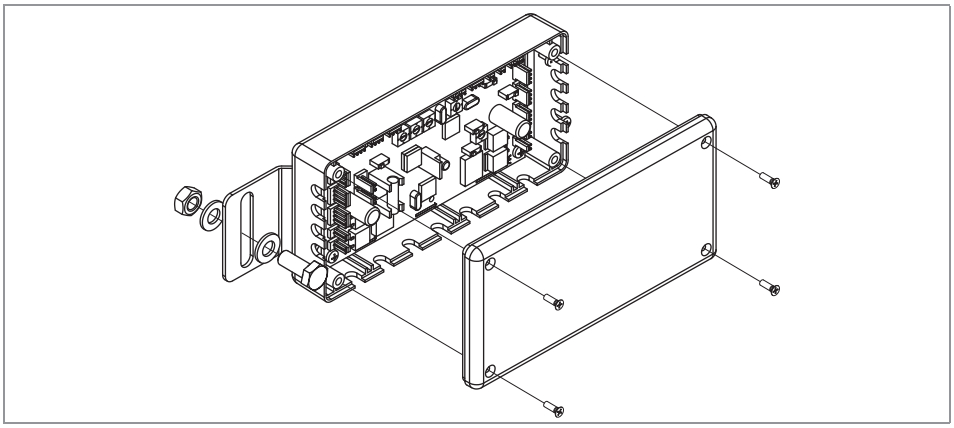
Risk of damage leading to Z-Card failure or shortened life expectancy

- ➢ Observe the following notices.

- ➢ Do not drop or mishandle the Z-Card, the box, or the holder to avoid internal damage.
- ➢ Check each Z-Card visually for damage prior to assembly.

Installing the Z-Card in a conveyor system

Mounting hardware is not supplied with the Z-Card. Choose adequate screws and nuts for the 8.5 mm x 36.5 mm (0.33 in x 1.44 in) long hole in the holder.



There are two ways to install the Z-Card in the conveyor:
- Using an existing Roller bolt.
- Using a newly drilled mounting hole.

The second way is described here.

More detailed assembly instructions are available at Interroll.

- ➢ Use the box holder as a template and mark the center of the mounting hole.
- ➢ Drill an 8 to 8.5 mm (0.31 - 0.33 in) mounting hole at the marked spot.
- ➢ Insert a screw in the hole.
- ➢ Install the Z-Card to the frame with the arrows on the Z-Card showing in the direction of travel and the screw protruding through the mounting hole.
- ➢ Slip a nut to the screw and tighten it.
- ➢ Ensure that there is a ground path between the Z-Card and the conveyor frame it is mounted to.

The Z-Card and conveyor frame should be at the same potential referenced to grounding.

Warnings concerning electrical installation

NOTICE

Risk of damage to the Z-Card

➢ Observe the following notices.

- ➢ The electrical installation may only be executed by qualified and authorized persons.
- ➢ Disconnect the power before installing, removing, or rewiring the Z-Card. Ensure that the conveyor cannot be turned on accidentally.
- ➢ Do not apply AC current to the Z-Card at any time as this will cause irreparable damage.
- ➢ Do not apply too much stress to the connector pins. Bending the wires at the connector can cause damage to the insulation of the wires, which could result in failure of the Z-Card or the RollerDrive.
- ➢ Ensure that the Z-Card and the 24 VDC power source are properly earthed through the frame or supporting structure. Failure to do so could cause the buildup of static electricity and can cause the motor or Z-Card to malfunction or fail prematurely.
- ➢ Do not spin the RollerDrive manually, as this generates an induction voltage which could damage the Z-Card.

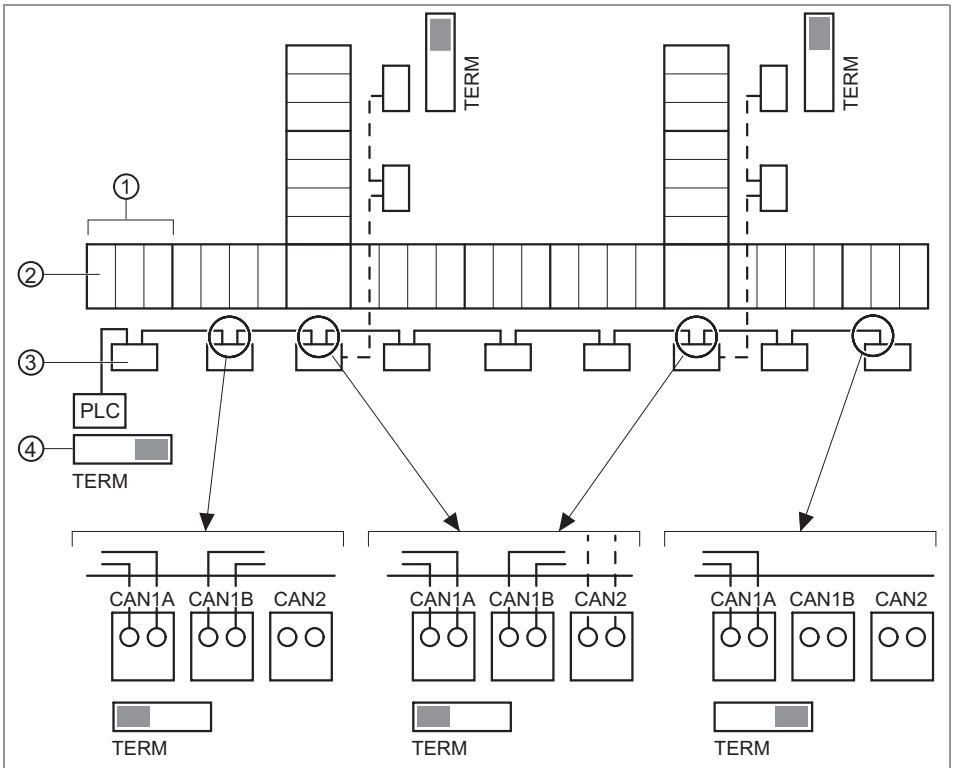
Electrical installation

There are special cables designed for the connection of the Z-Card (*see "Accessories", page 60*).

- ➢ Use these cables to connect the Z-Card to the power supply, to other Z-Cards, to the RollerDrive or DriveControl, to the PLC and to the sensors. For the positions of the connector pins *see "Components", page 6* and *see "Inputs and outputs", page 12*.
- ➢ Use cable ties to fix the cables to the conveyor frame.
- ➢ Insert a sealing grommet into every unused slot of the Z-Card box.
- ➢ Close the cover of the Z-Card box and fix it with the related screws.

CAN bus connection

The following diagram shows an example of how a PLC and multiple Z-Cards are connected via a CAN bus. Information on connections *see page 18*.



① Module
② Zone
③ Z-Card
④ CAN bus termination switch

- Select a unique ID (*see "ID rotary switch", page 20*) for each Z-Card.
- Avoid ring circuits as stated in the CAN specification.
- Make sure that the cable length of a physical bus is no longer than 130 m.
- Activate the terminator switch for the last piece of machinery connected to each CAN1 bus (*see "CAN terminator switch", page 23*) to terminate it. The CAN2 bus is always terminated on the Z-Card.

Initial startup and operation

Initial startup

Inspections before initial startup

- Ensure that all bolts are tightened according to the specifications.
- Ensure that no additional dangerous areas arise due to interfaces with other components.
- Ensure that the wiring is in accordance with specifications and legal guidelines.
- Check all protection devices.
- Ensure that no bystanders are in dangerous areas around the conveyor.

Operation

⚠ CAUTION

Rotating parts
Risk of crushed fingers

- Ensure there are no bystanders in dangerous areas around the conveyor.
- Ensure that all protection devices are installed correctly.

Checks before every startup

- Check the Z-Card for visible damage.
- Check the position of all dip switches and all rotary selectors.
- Check all protection devices.
- Clearly specify and monitor the way goods are placed on the conveyor.

Changing settings

- Remove the screws of the Z-Card box cover and open the box.
- To turn the rotary selectors, use a small screwdriver.
- Set the dip switches carefully with a finger.
- Close the cover of the Z-Card box and fix it with the related screws.

Maintenance and cleaning

Warning notices concerning maintenance and cleaning

⚠ CAUTION

Risk of injuries due to incorrect handling

- ➢ Maintenance work and cleaning must only be performed by qualified and authorized persons.
- ➢ Perform maintenance work only after switching off the power. Ensure that the system cannot be switched on accidentally.
- ➢ Set up signs indicating that maintenance work is in progress.

Maintenance

Checking the Z-Card

The Z-Card must be checked at regular intervals to avoid malfunctions.

- ➢ Monthly check the Z-Card and its leads for visible damage.
- ➢ Annually ensure that the screws of the Z-Card are still tight and that the cables are still laid properly and connected to the terminals.

Replacing the Z-Card

If a Z-Card is damaged, it has to be replaced.

- ➢ Install a new Z-Card (*see "Abandonment", page 59* and *see "Assembly", page 52*).

Cleaning

Dust and dirt in combination with humidity may bridge the electric circuit. Therefore, in a dirty environment, periodic cleaning will help to avoid short-circuits which could damage the Z-Card.

- ➢ Regularly blow off dust and dirt by using low compressed air.

Troubleshooting

Troubleshooting

Should the module not be functioning properly:

- Ensure that the wiring is correct.
- Ensure that the module is correctly powered and is 24 VDC.
- Verify whether the program rotary selector is in the correct position.

Symptom	Possible cause	Help
Yellow LED is not lit.	Fuse is blown.	Check fuse and replace it if necessary. If the problem continues, replace the module.
	No power supply	Check 24-VDC power supply of the Z-Card.
Motors are not running and power supply to sensors is off.	Fuse is blown.	Check fuse and replace it if necessary.
	No power supply	Check 24-VDC power supply of the Z-Card.
Motors are not operating, but power supply to sensors is on.	Incorrect NPN/PNP settings.	Check the setting of the NPN/PNP switch and correct it if necessary.
Motors are rotating in the wrong direction.	Wrong FWD/REV settings.	Check the the FWD/REV switch setting and correct it if necessary.
	RollerDrive selection switch set incorrectly.	Check the RollerDrive selector switch setting and correct it if necessary.
Module receives no packages from the upstream module or does not transport any packages to the downstream module.	Wrong communication switch.	Check the communication switch to the upstream/downstream module and correct if necessary.
	Interface Z-Card/ZoneControl set incorrectly.	Correct setting of dip switch 8.
Merger/diverter module receives/passes no packages from/to merger/diverter module	The Z-Card has a wrong ID for the CAN-Bus communication.	Verify the ID at the ID rotary selector. It must not be set to 0.

Abandonment and disposal

Abandonment

⚠ CAUTION

Risk of injury due to improper handling

- ➢ Abandonment may only be executed by qualified and authorized persons.
- ➢ Only abandon the Z-Card after switching off the power. Ensure that the Z-Card cannot be turned on accidentally.

- ➢ Disconnect all cables from the Z-Card.
- ➢ Unscrew the screws attaching the Z-Card to the conveyor frame.
- ➢ Extract the Z-Card from the conveyor frame.

Disposal

The operator is responsible for the proper disposal of the Z-Card. In doing so, industry-specific and local provisions must be observed for the disposal of the Z-Card and its pakkaging.

Appendix

List of abbreviations

CAN	Controller Area Network
DC	DriveControl
DOWN	Downstream zone
HC	HybridControl
LPA	Low Pressure Accumulation
PB	Powerbus (power supply)
PLC	Programmable Logic Controller
SIDE	Merge or diverter
UP	Upstream zone
ZPA	Zero Pressure Accumulation (*see page 10*)

Accessories

DriveControls

Part	Properties	Item no.
HC-EC100/110	HybridControl with ZPA and motor control on one board, but can be used separately (for RollerDrive EC110 and EC110)	9006

Interface card

Part	Item no.
Interface card	39650

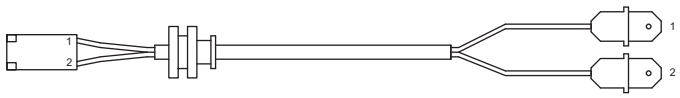
Pre-assembled cables

These cables are specially designed and pre-assembled for the Z-Card.

Cable	Length	Item no.
24 VDC power cable PB2 (controller power supply)	500 mm (19.7 in)	31909
EC1xx RollerDrive cable	500 mm (19.7 in)	31915
	1000 mm (39.4 in)	31916
	2000 mm (78.7 in)	31917
EC310 RollerDrive cable	500 mm (19.7 in)	51589
	1000 mm (39.4 in)	51590
	1500 mm (59.1 in)	53667
	2000 mm (78.7 in)	51591
	3500 mm (137.8 in)	51592
Sensor cable	500 mm (19.7 in)	31923
	1000 mm (39.4 in)	31924
	1500 mm (59.1 in)	31995
	2000 mm (78.7 in)	31925

Cable	Length	Item no.
CAN bus cable	3500 mm (137.8 in)	31919
	4500 mm (177.2 in)	31920
Communication cable	1000 mm (39.4 in)	60580
	2000 mm (78.7 in)	60581
	3000 mm (118.1 in)	60583
	4000 mm (157.5 in)	60585
	5000 mm (196.8 in)	60586
PLC cable	3000 mm (118.1 in)	31918

24 VDC power cable for the controller power supply (PB2)



SL156-2+contact for AMP-MTA-156-2 plug

① 24 VDC (red)
② GND (black)

Blade Terminal F6.3

① 24 VDC (red)
② GND (black)

EC1xx RollerDrive cable

CST-100-8+contact for AMP-MTA-100-2-plug

① ---
② No error (gray)
③ ---
④ REV (green)
⑤ FWD (pink)
⑥ Analog speed (yellow)
⑦ 24 VDC (brown)
⑧ GND (white)

End splices

① No error (gray)
② REV (green)
③ FWD (pink)
④ Analog speed (yellow)
⑤ 24 VDC (brown)
⑥ GND (white)

EC310 RollerDrive cable

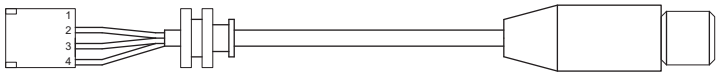
CST-100-8+contact for AMP-MTA-100-2-plug

① No error (black)
② ---
③ Rotation direction (white)
④ ---
⑤ ---
⑥ Speed (yellow-green)
⑦ 24 VDC (brown)
⑧ GND (blue)

Lumberg connector FKT5-228

① No error (black)
② Rotation direction (white)
⑥ Speed (yellow-green)
⑦ 24 VDC (brown)
⑧ GND (blue)

Sensor cable



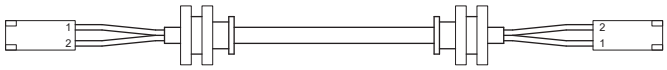
CST-100-4+contact for AMP-MTA-100-4 plug

① ---
② 24 VDC sensor output (brown)
③ Sensor signal (black)
④ GND (blue)

Coupling M8x1-3 pole straight (Wenglor S49 or equivalent)

① Sensor signal (black)
② ---
③ GND (blue)
④ 24 VDC sensor output (brown)

CAN bus cable



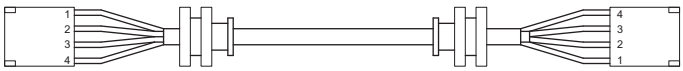
CST-100-2+contact for AMP-MTA-100-2 plug

① CAN high (brown)
② CAN low (white)

CST-100-2+contact for AMP-MTA-100-2 plug

② CAN low (brown)
① CAN high (white)

Communication cable



CST-100-4+contact for AMP-MTA-100-4 plug

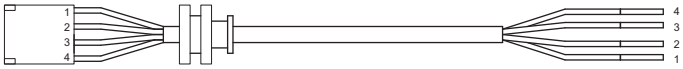
① yellow
② brown
③ green
④ white

CST-100-4+contact for AMP-MTA-100-4 plug

④ brown
③ yellow
② white
① green

Cable cross-section: 0.25 mm^2

PLC cable



CST-100-4+contact for AMP-MTA-100-4 plug	End splices
① yellow	① yellow
② brown	② brown
③ green	③ green
④ white	④ white

Cable cross-section: 0.25 mm^2

Installation declaration

In accordance with the EC Machinery Directive 2006/42/EC, Appendix II B.

the manufacturer:

Interroll Automation GmbH
Dietmar-Hopp-Str. 3
D - 74889 Sinsheim
Germany

hereby declares with sole responsibility that the product range

- Z-Card 3.0

is not a ready-to-use machine as defined by the EC Machinery Directive and, therefore, does not fully comply with the requirements of this directive. The commissioning of these conveyor modules is not permitted unless conformity of the entire machine/system in which they are installed has been declared in compliance with the EC Machinery Directive.

The health and safety requirements as stated in Appendix I have been applied. The special technical documents mentioned in Appendix VII B have been prepared and will be sent to the responsible authority if necessary.

Person responsible for EC documentation: Interroll Automation GmbH, Dietmar-Hopp-Str. 3, D-74889 Sinsheim

Applicable EC directives:
- Machinery Directive 2006/42/EC
- Low Voltage Directive 2006/95/EC
- EMC Directive 2004/108/EC

Applicable harmonized standards:
- EN ISO 12100-1 "Safety of machinery - Basic concepts, general principles for design - Part 1: Basic terminology, methodology"
- EN ISO 13857 "Safety of machinery - Safe distances to prevent upper and lower limbs from entering hazard zones"
- EN 349 "Safety of machinery - Minimum distances to prevent crushing of body parts"
- EN 60204-1 "Safety of machinery - Electrical equipment of machinery - Part 1: General requirements"

Sinsheim, dated

Dr.-Ing. Heinrich Droste

(Managing Director)

(A copy of this declaration can be obtained at www.interroll.com, if needed.)

©copyright

Version 1.2 (09/2013) en
Translation of the original instructions

For your local contacts please visit
interroll.com/contacts